

## CASE STUDY – Bagging

TASK TITLE: Bagging

### Task Description:

The Bagging task may be involved when working in a deli, grocery store, convenience store or commissary. Bagging tasks involve placing scanned or checked items in plastic or paper bags. This case study does not include scanning / bar coding items with a stationary or hand-held scanner. Please see the Case Study 19 - Scanning Groceries / Tendering Money for issues concerning other aspects of checkout.

Typical jobs in which Bagging tasks are performed include (but are not necessarily limited to):

- Commissary
- Convenience store
- Restaurant

### Job Performance Measures Most Often Impacted by Bagging:

Measures of job performance can include (but are not limited to):

- Time required to complete task

### Typical Employee Comments about Bagging:

Employees typically experience discomfort in the back and shoulders.

The shoulder/neck and back/torso are the body areas that most commonly receive a “High” priority rating. The remaining areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.

### Suggested Level II Analysis:

Postural Analysis, Biomechanical Lifting Analysis


## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Object must be lifted over bag's edge before lowered</li> </ul>	150.Re-design work space <ul style="list-style-type: none"> <li>place the bagging area directly beside the individual rather than off to one side</li> <li>lower the bag so that items are dropped into the bag rather than raising the item to clear the edge of the bag</li> </ul>	✓		low	low	med
			✓		low	low	med
2. Arm forces: Repeated arm forces or holding / carrying materials	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lift</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>implement an advanced checkout system that has clients bag their own items</li> </ul>		✓	high	high	high
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling items.</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements to bring grocery items towards them</li> </ul>	✓		low	low	low
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Shape of item causes awkward wrist positions when bagging</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	low
		25. Increase task variety	✓		low	low	low
		20. Incorporate rest pauses	✓		low	low	low
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> </ul> 	13. Encourage ergonomic work techniques	✓ ✓		low low	med low	med low
		11. Eliminate unnecessary tasks		✓	high	high	high
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> <li>Item has no handles</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	low

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Rarely occurs - handling of frozen goods is too low to be considered an exposure</li> </ul>	N/A					

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Object is too far away</li> <li>Object must be lifted over bag's edge before lowered</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions</li> <li>walk around the counter to handle items located in grocery carts</li> <li>use conveyor system to bring groceries</li> </ul>	✓		low	low	low
			✓		low	low	low
			✓		low	low	low
		150. Re-design work area <ul style="list-style-type: none"> <li>place the bagging area directly beside the individual rather than off to one side</li> <li>lower the bag so that items are dropped into the bag rather than raising the item to clear the edge of the bag</li> </ul>	✓		low	low	med
			✓		low	low	med
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Access is restricted to items that need to be handled</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>place the bag on its side when loading items into the bag rather than placing the bag in an upright position</li> </ul>	✓		low	low	low
		150. Re-design work area <ul style="list-style-type: none"> <li>place the bagging area directly beside the individual rather than off to one side</li> <li>lower the bag so that items are dropped into the bag rather than raising the item to clear the edge of the bag</li> </ul>	✓		low	low	med
			✓		low	low	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements, or lifting awkward, uneven, shifting or bulky items	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling items</li> </ul>	✓		low	low	low
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>implement an advanced checkout system that has clients bag their own items</li> </ul>		✓	high	high	high
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Work positioned too low</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>raise cash counter or grocery counter so that the items are located just below elbow height</li> </ul>		✓	high	med	med
16. Lifting forces	<ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	142. Use two or more persons to perform the transfer	✓		low	low	low
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>implement an advanced checkout system that has clients bag their own items</li> </ul>		✓	low	low	low
		<ul style="list-style-type: none"> <li>Instruct customers to leave heavy items in basket and use a hand-held scanner</li> </ul>	✓		low	low	med

Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Stands in one position</li> </ul>	52. Provide a footrail or footrest <ul style="list-style-type: none"> <li>provide a footrest/footrail that allows the person to periodically raise one leg</li> </ul>		✓	med	low	low



## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Stands on a hard surface</li> <li>Leans against conveyor frame</li> </ul>	86. Provide an appropriate anti-fatigue mat		✓	med	med	med
		96. Provide appropriate shoe inserts	✓		low to med	med	med
		9. Eliminate exposure to hard edges		✓	med	low	low
		• provide high density foam padding					
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Lack of toe clearance</li> </ul>	81. Provide adequate toe clearance		✓	med to high	low	med

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					


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## CASE STUDY - Baking

### TASK TITLE: Baking

<b>Task Description:</b>	<p>The Baking task involves the preparation of baked foods such as breads, cakes, pies and pastries. This includes moving boxes and bins of ingredients, mixing ingredients in large mixing bowls and moving pans to and from the ovens. Cooking (Food Preparation) and Cooking (Short-order Grill) are addressed in other case studies in this Guide.</p> <p>Typical examples in which the Baking tasks can occur include (but are not limited to) are:</p> <ul style="list-style-type: none"><li>• Cafeterias and mess halls</li><li>• Restaurants</li><li>• Clubs</li></ul>
<b>Job Performance Measures Most Often Impacted by Baking:</b>	<p>Measures of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Hours daily to complete Baking tasks</li><li>• Taste of food</li></ul>
<b>Typical Employee Comments about Baking:</b>	<p>Employees typically experience discomfort in the legs/feet and lower back. They generally attribute this discomfort to a combination of standing on hard surfaces and lifting heavy bowls.</p> <p>The back/torso is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	Dynamic Task Analysis, Biomechanical Lifting Analysis, Push/Pull Analysis

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Work area too high</li> </ul> 	32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>position ingredient prep work near or just above elbow level</li> <li>use an adjustable height table</li> <li>provide height adjustable mixing bowls</li> <li>provide several alternate work height prep tables</li> </ul>	✓		low	med	med
	<ul style="list-style-type: none"> <li>Items stored too high</li> </ul>	123. Raise the person <ul style="list-style-type: none"> <li>provide a portable work platform which can be easily stored under the table, out of the way</li> </ul>		✓	med to high	low	low
		123. Raise the person <ul style="list-style-type: none"> <li>provide a footstool or small step</li> </ul>	✓		low	low	low

### Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Items stored too high (cont'd)	32. Lower the work piece/work surface					
		• place frequently accessed and/or heavy ingredients on shelves between mid-thigh and chest height	✓		low	low	med
		13. Encourage ergonomic work techniques					
	• Work too far away	• avoid stacking baking trays above shoulder height in cart racks	✓		low	low	low
		41. Move work piece closer to body	✓		low	low	low
		• slide the work closer before lifting					
	• Too many supplies on workstation	149. Provide appropriate tools	✓		med	low	low
		• provide a rake-type tool to grasp containers					
		41. Move work piece closer to body	✓		low	low	low
		• place frequently used items with easy reach					
		• modify storage containers to reduce reach requirements		✓	med	med	med
		• provide dispensing mechanisms for ingredients		✓	med to high	med	med

## Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Reaching into oven to place/remove items in back</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>install an oven with a vertical or horizontal rotisserie/carousel in order to minimize reaching and bending</li> </ul>		✓	high	low	med
2. Arm forces: Repeated arm forces or holding/carrying materials	<ul style="list-style-type: none"> <li>Carrying stacks of pans and ingredient cases</li> </ul>	48. Provide a cart <ul style="list-style-type: none"> <li>use existing carts</li> <li>provide sufficient number of carts to insure availability</li> </ul>	✓	✓	low med	low low	low med
		4. Change a lifting/carrying task into a rolling or sliding tasks <ul style="list-style-type: none"> <li>provide carts which can be adjusted to bench, shelf and oven heights to minimize lifting</li> </ul>		✓	med	med	high
	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> <li>install appropriate wheels; select larger wheels for the tile floors.</li> </ul>	✓ ✓		med med	med med	med med
	<ul style="list-style-type: none"> <li>Freezer door is difficult to open</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>replace freezer door with an air curtain</li> </ul>		✓	high	low	med

### Shoulder/Neck (Cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Freezer door is difficult to open (continued)</li> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms	✓		med	low	med
		<ul style="list-style-type: none"> <li>perform routine lubrication and maintenance on the freezer door to limit force requirements</li> <li>lubricate door hinges</li> </ul>	✓		low	low	med
		17. Improve floor condition	✓		low	med	med
		<ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓	✓	high med	med med med	med med med
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lift</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	low
		128. Reduce force required to install or remove component <ul style="list-style-type: none"> <li>approach vendor regarding means for reducing object weight</li> </ul>		✓	med	med	med



### Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Freezer door is difficult to open</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>perform routine lubrication and maintenance on the freezer door to limit force requirements</li> <li>lubricate door hinges</li> </ul> 11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>replace freezer door with an air curtain</li> </ul>	✓  ✓	✓	med  low  high	low  low  low	med  med  med
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Location of work too low</li> </ul>	20. Incorporate rest pauses  124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide a riser or block to raise work surface</li> </ul>	✓  ✓		low  low	low  high	med  high

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Hand manipulating dough and other ingredients</li> </ul> 	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use powered food mixers for as many tasks as possible</li> </ul> 11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>purchase ingredients already prepared and packaged to size</li> </ul>	✓		med	low	med
				✓	med	low	med

## Hands/Wrists/Arms (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Hand manipulating dough and other ingredients</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use powered food mixers for as many tasks as possible</li> </ul>	✓		med	low	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>purchase ingredients already prepared and packaged to size</li> </ul>		✓	med	low	med
		20. Incorporate rest pauses	✓		low	low	low
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Cake decorating</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use a dispenser that is triggered appropriately</li> </ul>		✓	low	low	med
		20. Incorporate rest pauses	✓		low	low	low
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>position hand to minimize holding the thumb or a finger away from the rest of the hand</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Using sifter</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a tool that allows a comfortable hand position, particularly grip width.</li> </ul>		✓	low to med	low	low

## Hands/Wrists/Arms (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Fingertip forces from prying apart pans that are stuck together</li> </ul>	128. Reduce force required to install or remove component	✓		low	low	med
		<ul style="list-style-type: none"> <li>use a small wedge to separate pans</li> <li>use a spoon to perform the prying task</li> </ul>	✓		low	low	med
	<ul style="list-style-type: none"> <li>Holding pans back too far on the handle</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>choke up on handle to improve control of pan</li> </ul>					
	<ul style="list-style-type: none"> <li>Hand manipulating dough and other ingredients</li> </ul>	94. Provide appropriate handles		✓	med	med	med
		<ul style="list-style-type: none"> <li>provide handles that are insulated to prevent contact with hot surfaces.</li> </ul>					
		149. Provide appropriate tools	✓		med	low	med
		<ul style="list-style-type: none"> <li>use powered food mixers for as many tasks as possible</li> </ul>					
		11. Eliminate unnecessary tasks		✓	med	low	med
		<ul style="list-style-type: none"> <li>purchase ingredients already prepared and packaged to size</li> </ul>					

### Hands/Wrists/Arms (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Tearing open ingredient boxes and bags</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>use a knife to open boxes and bags</li> </ul>	✓		low	med	med
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a utility razor to open boxes and bags</li> </ul>	✓		low	med	med
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Hard edges from handing trays, pans and utensils</li> </ul>	93. Provide appropriate gloves	✓		med	low	low
		9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>use pot holders to avoid exposure to hard edges</li> </ul>	✓		low	low	low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Working in freezers, working with cold ingredients</li> </ul>	93. Provide appropriate gloves <ul style="list-style-type: none"> <li>provide insulated gloves covered by an outer layer of plastic</li> </ul>		✓	med	low	low

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Oven heights, mixer bowl heights and storage heights too low</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>use oven rack heights between mid-thigh and mid-chest height whenever possible</li> </ul>	✓		low	low	low
		124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>place frequently accessed and/or heavy ingredients on shelves between mid-thigh and chest height</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>provide a small portable lift cart that will allow the mixer bowl to be lifted to table height</li> </ul>		✓	med	low	low
		148. Provide appropriate equipment <ul style="list-style-type: none"> <li>install an oven with a vertical or horizontal rotisserie/carousel in order to minimize reaching and bending</li> </ul>		✓	high	low	med

## Back/Torso (Cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Stacking items on low shelves of cart causes awkward bending</li> <li>Person tends to use the back to lift instead of using the legs to assist in the lift (check for contributing factor in the workplace)</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>use cart shelves between knee and shoulder heights whenever possible</li> </ul>	✓		low	low	low
		48. Provide a cart <ul style="list-style-type: none"> <li>provide a cart that has spring loaded shelves (e.g., dish cart) or use a cart which has the bottom shelf removed</li> </ul>		✓	med	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use leg muscles to lift</li> </ul>	✓		low	low	low
		48. Provide a cart <ul style="list-style-type: none"> <li>provide a cart that has spring loaded shelves (e.g., dish cart) or use a cart which has the bottom shelf removed</li> </ul>		✓	med	med	med

## Back/Torso (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Work area layout</li> </ul>	130. Reduce the angle a person has to turn to transfer an item	✓		low to high	low	med
		<ul style="list-style-type: none"> <li>for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> <li>reposition supplies/materials to reduce twisting</li> </ul>	✓		low to high	low	med
		13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use legs to pivot when handling a load</li> </ul>	✓		low	low	low
14. High speed, sudden movements <b>or</b> Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling items</li> </ul>	✓		low	low	med
		147. Provide an alternate container		✓	med	med	med
		<ul style="list-style-type: none"> <li>contact vendor to request addition of handles or repackaging of contents to increase density</li> </ul>					



### Back/Torso (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Bending over scooping ingredients from mixer bowl</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide a small portable lift cart that will allow the mixer bowl to be lifted to table height</li> </ul>		✓	med	med	med
16. Lifting forces	<ul style="list-style-type: none"> <li>Lifting full pans from the oven. Lifting ingredients from shelves. Lifting mixing bowls.</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>provide adjustable height carts which adjust to bench, shelf and oven heights to minimize lifting</li> </ul>		✓	med	med	med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Lifting full pans from the oven. Lifting ingredients from shelves. Lifting mixing bowls. (continued)</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to keep load as close to body as possible</li> </ul> 11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>investigate bulk delivery of flour and other supplies</li> </ul> 124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide a small portable lift cart that will allow the mixer bowl to be lifted to table height</li> </ul>	✓	✓    ✓  ✓	high  high  med	med  med  med	med  med  med
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul> 119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul> 17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓  ✓	✓  ✓  ✓	med  med  low high med	med  med  high med med	med  med  high med med

## **Back/Torso (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Freezer door is difficult to open</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>replace freezer door with an air curtain</li> </ul> 35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>perform routine lubrication and maintenance on the freezer door to limit force requirements</li> <li>lubricate door hinges</li> </ul>		✓	high	low	med
			✓		med	low	med
			✓		low	low	med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Prolonged standing</li> </ul>	52. Provide a footrail or footrest <ul style="list-style-type: none"> <li>provide a footrest/footrail that allows the person to periodically raise one leg</li> </ul>		✓	low to med	low	med
20. Exposure to hard edges on legs, knees, and feet <b>or</b> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Standing on a hard surface</li> </ul>	86. Provide an appropriate anti-fatigue mat  96. Provide appropriate shoe inserts		✓  ✓	med  med	low  low	med  med
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high		18. Improve visual access to work • Light levels should be 75fc to 125fc for work		✓	low	med	med
24. Intensive visual tasks, staring at work objects for long periods	• Cake decorating	20. Incorporate rest pauses	✓		low	low	low


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## CASE STUDY – Commissary/Meat Cutting


### TASK TITLE: Commissary/Meat Cutting

<b>Task Description:</b>	<p>The Commissary/Meat Cutting task may be involved when working in a deli, meat-cutting counter or small meat processing facility within a commissary. Cutting methods can involve both automated equipment and manual meat cutting with a knife</p> <p>Typical jobs in which the Commissary/Meat Cutting task occurs can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Commissary Deli</li> <li>• Commissary Meat Cutting</li> <li>• Restaurant</li> </ul>
<b>Job Performance Measures Most Often Impacted by Commissary/Meat Cutting:</b>	<p>Measures of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Type of cut</li> <li>• Quality of cut</li> <li>• Number of cuts</li> </ul>
<b>Typical Employee Comments about Commissary/Meat Cutting:</b>	<p>Employees typically experience discomfort in the hand/wrists/arms, legs/feet, and back.</p> <p>The shoulders/neck and hands/wrists/arms are the body areas that most commonly receive a “High” priority rating. The remaining areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	NIOSH Lifting Equation, Biomechanical Lifting Analysis, Push/Pull Force Analysis

## Shoulder/Neck


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Meat placed too far from person</li> </ul>	41. Move work piece closer to body <ul style="list-style-type: none"> <li>place the meat near the edge of the cutting table when cutting</li> </ul>	✓		low	low	low
		149. Provide appropriate tool <ul style="list-style-type: none"> <li>use a hook type tool to pull meat closer when handing meat from one person to another person during processing</li> </ul>	✓		high	low	low
	<ul style="list-style-type: none"> <li>Repetitive sawing tasks</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>install a riser on the front sliding surface of saw. This will raise the meat higher and make use of gravity to drop the meat into a collection tray. This would eliminate a repetitive throwing task and reduce the chance of severe cuts from the saw blade</li> </ul>	✓		low to med	high	high

### Shoulder/Neck (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/carrying materials	<ul style="list-style-type: none"> <li>Meat box is too heavy</li> </ul> 	48. Provide a cart <ul style="list-style-type: none"> <li>when moving boxes of meat place the box on a cart</li> </ul>		✓	high	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>move around the pallet rather than reach over the pallet to reach and lift boxes of meat</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low	low	low
		119. Provide wheels <ul style="list-style-type: none"> <li>install appropriate wheels</li> </ul>		✓	high	med	med
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓		low med high	low low med	low low med
	<ul style="list-style-type: none"> <li>Meat is difficult to cut</li> </ul>	137. Sharpen blades frequently <ul style="list-style-type: none"> <li>encourage person to frequently sharpen knife while cutting</li> </ul>	✓		low	med	med



### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lifting boxes of meat</li> <li>Repetitive sawing tasks</li> </ul> 	48. Provide a cart <ul style="list-style-type: none"> <li>store meat on a height adjustable cart</li> </ul>		✓	med	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth, fluid movements while handling items</li> </ul>	✓		low	low	low
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>install a riser on the front sliding surface of saw. This will raise the meat higher and make use of gravity to drop the meat into a collection tray. This would eliminate a repetitive throwing task.</li> </ul>	✓		low to med	high	high
		25. Increase task variety	✓		low	low	low
		137. Sharpen blades frequently <ul style="list-style-type: none"> <li>encourage person to frequently sharpen knife while cutting</li> </ul>	✓		low	low	low
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Work is positioned too low</li> </ul>	20. Incorporate rest pauses	✓		low	low	low
		25. Increase task variety	✓		low	low	low
		83. Provide an adjustable height lift table <ul style="list-style-type: none"> <li>provide a small stand to raise and tilt the work toward the person</li> </ul>	✓		low to med	low	low

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Location of the work and angle of the cut causes awkward wrist postures</li> </ul> 	66. Provide power tool <ul style="list-style-type: none"> <li>provide a powered knife for repetitive cutting tasks</li> </ul>		✓	high	med	med
		77. Provide a tool with an appropriate handle angle <ul style="list-style-type: none"> <li>for straight horizontal cutting, use a knife with a vertical handle that encourages a neutral wrist position</li> </ul>	✓		med	med	med
		25. Increase task variety <ul style="list-style-type: none"> <li>alternate meat-cutting tasks – move from a manual cutting task to more automated meat cutting on the saws or packing lines</li> </ul>	✓		low	low	low
		137. Sharpen blades frequently <ul style="list-style-type: none"> <li>ensure knife is regularly sharpened while cutting</li> </ul>	✓		Low	Med	Med
		136. Rotate the work <ul style="list-style-type: none"> <li>turn the meat while cutting to position the meat in a location that prevents awkward wrist postures</li> </ul>	✓		low	low	low

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Repetitive sawing tasks</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>install a riser on the front sliding surface of saw. This will raise the meat higher and make use of gravity to drop the meat into a collection tray. This would eliminate a repetitive throwing task</li> </ul> 25. Increase task variety           137. Sharpen blades frequently <ul style="list-style-type: none"> <li>encourage person to frequently sharpen knife while cutting</li> </ul>	✓		low to med	high	high
			✓		low	low	low
			✓		low	low	low
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Repetitive sawing tasks</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>install a riser on the front sliding surface of saw. This will raise the meat higher and make use of gravity to drop the meat into a collection tray. This would eliminate a repetitive throwing task</li> </ul> 25. Increase task variety           137. Sharpen blades frequently <ul style="list-style-type: none"> <li>encourage person to frequently sharpen knife while cutting</li> </ul>	✓		low to med	high	high
			✓		low	low	low
			✓		low	low	low

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
7 Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Work technique</li> </ul>	66. Provide power tool <ul style="list-style-type: none"> <li>provide a powered knife for repetitive cutting tasks</li> </ul>		✓	high	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>hold fingers close together</li> <li>avoid extending fingers while cutting, such as placing thumb along top of knife</li> </ul>	✓ ✓		low low	low low	low low
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Meat is difficult to cut</li> <li>Handle is slippery</li> <li>Gloves are bulky and do not properly fit</li> </ul>	137. Sharpen blades frequently <ul style="list-style-type: none"> <li>encourage the person to regularly sharpen knife while cutting</li> </ul>	✓		low	low	low
		54. Provide a high friction gripping surface <ul style="list-style-type: none"> <li>provide a knife with a surface that improves gripping</li> <li>consider cutting on stainless steel surfaces</li> </ul>	✓	✓	med med	med med	low med
		93. Provide appropriate gloves <ul style="list-style-type: none"> <li>use gloves that fit properly and allow for full movement of the hand</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>use gloves that provide a textured surface for improved grip</li> </ul>		✓	low	low	low

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Use of a power knife that is poorly maintained</li> <li>Repetitive sawing or slicing tasks</li> </ul>	34. Maintain hand tool/power tools <ul style="list-style-type: none"> <li>ensure powered knife is well maintained</li> </ul>	✓		low	med	med
		137. Sharpen blades frequently	✓		low	med	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>install a riser on the front sliding surface of saw. This will raise the meat higher and make use of gravity to drop the meat into a collection tray. This would eliminate a repetitive throwing task</li> </ul>	✓		low to med	high	high
		25. Increase task variety	✓		low	low	low
		137. Sharpen blades frequently <ul style="list-style-type: none"> <li>encourage person to frequently sharpen blades while cutting</li> </ul>	✓		low	low	low

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Hook has a small handle or hard edges on the handle</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a D handle instead of a T handle</li> <li>increase handle diameter to 1-1½" (2.5-2.8cm)</li> </ul>		✓	med	low	low
				✓	low to med	low	low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> </ul>	93. Provide appropriate gloves <ul style="list-style-type: none"> <li>use gloves that fit properly, do not restrict movement of the hand, and use a textured surface for improved grip</li> <li>provide gloves which insulate hands and provide a moisture barrier</li> </ul>	✓		low	low	low
			✓		low	low	low

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	• Object is too low	124. Raise the work piece/work surface					
		• place boxes of meat on pallets to raise the boxes off the floor surface	✓		low	low	low
		• place pallet of boxes on a height adjustable scissor lift		✓	high	med	med
	• Object is too far away	• ensure heavy items are placed between knee and waist height for easy handling	✓		low	low	low
		41. Move work piece closer to body					
		• pull meat to edge of table	✓		low	low	low
	• There is no place to store the case of meat at the workstation	12. Provide adequate workspace					
		• ensure space is provided around all four sides of the pallet so that the individual can move in close enough to the item stored on the pallet	✓		low	low	low
		24. Increase size of work surface					
		• rearrange work station to provide additional storage space	✓		low	med	med
		• provide larger work surface area		✓	med	med	med
		124. Raise the work piece/work surface					
		• place meat at a table	✓		low to med	med	med
		48. Provide a cart					
		• store meat on an adjustable cart		✓	med	med	med

### Back/Torso (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person tends to use the back to lift instead of using the legs to assist in the lift. Check to make sure that there is no contributing factor in the workplace.</li> </ul>	130. Reduce angle a person turns to transfer items <ul style="list-style-type: none"> <li>place adjacent work surfaces at 90 degrees to one another</li> </ul> 48. Provide a cart <ul style="list-style-type: none"> <li>provide a cart with height adjustable shelves</li> </ul> 13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use leg muscles to lift</li> </ul>		✓  ✓	med  med  low low	med  med  low low	med  med  low low
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	130. Reduce angle a person turns to transfer items <ul style="list-style-type: none"> <li>place adjacent work surfaces at 90 degrees to one another</li> </ul> 13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use legs to pivot when handling a load</li> </ul>		✓  low low	med  low low	med  low low	med  low low




### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items	<ul style="list-style-type: none"> <li>Lifting cases of meat</li> <li>Box or meat is frozen to storage surface making it difficult to move</li> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>provide a height adjustable cart for transporting cases of meat</li> </ul>		✓	med	med	med
		128. Reduce force required to install or remove component <ul style="list-style-type: none"> <li>Put a covering on the shelves to reduce friction</li> </ul>	✓		low	med	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>place meat in containers to eliminate removal directly from shelves</li> </ul>	✓		low	med	med
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a wedge or prybar that can be used to pry frozen boxes of meat apart</li> </ul>	✓		med	low	low
		61. Provide a mechanical lifting aid <ul style="list-style-type: none"> <li>provide a vacu-hoist or other means of mechanical assistance to move objects</li> </ul>		✓	med	low	low

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion (continued)</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth, fluid movements while handling items</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Loading hamburger into processing equipment</li> </ul>	30. Provide a mechanical lifting aid <ul style="list-style-type: none"> <li>provide a mechanical dumping device to load hamburger</li> </ul>		✓	med	low	low
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Work location too low</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>raise the worktable to encourage more neutral positions of the back. The task location should be just below elbow height for light cutting, and approximately 2-4"(5.1-10.2cm) below elbow height for heavy cutting of cold meat</li> </ul>		✓	high	med	med


### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Lifting forces	<ul style="list-style-type: none"> <li>Lifting cases of meat</li> </ul>  <ul style="list-style-type: none"> <li>Loading hamburger into processing equipment</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding task		✓	med	med	med
		<ul style="list-style-type: none"> <li>provide a height adjustable cart for transporting cases of meat</li> </ul>					
		20. Incorporate rest pauses	✓		low	low	low
		61. Provide a mechanical lift device		✓	med	low	low
		<ul style="list-style-type: none"> <li>provide a mechanical dumping device to load hamburger</li> </ul>					
		131. Reduce weight of work piece (boxes of meat)	✓		low	low	low
		<ul style="list-style-type: none"> <li>avoid over-packing trays of wrapped meat</li> <li>investigate the feasibility of ordering meat in smaller box sizes</li> </ul>		✓	low	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of car or piece of equipment causes high forces</li> <li>Cart or piece of equipment is too heavy to be pushed manually</li> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul>	✓		low	low	low
		19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low	low	low
		67. Provide a powered cart <ul style="list-style-type: none"> <li>provide motorized assistance to transport cart or piece of equipment</li> </ul>		✓	high	med	med
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low low high	low low med	low med med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Worker stands in one position</li> </ul>	52. Provide a footrest or footrail <ul style="list-style-type: none"> <li>provide a footrail or footrest under the work surface so the individual can elevate one leg while standing, encouraging a more neutral position of the back</li> </ul>	✓	✓	med	med	med
		96. Provide appropriate shoe inserts	✓		low	low	low
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Prolong standing</li> <li>Leans into edge of table</li> </ul> 	86. Provide an appropriate anti-fatigue mat		✓	med	med	med
		9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>redesign or round the front edge of worksurface</li> </ul>	✓		low to med	low	med

### Legs/Feet(cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Inadequate legroom under the surface restricts leg position</li> </ul>	80. Provide adequate leg clearance	✓		low	low	low
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Operates a foot pedal while standing</li> </ul>	145. Modify foot pedal <ul style="list-style-type: none"> <li>recess foot pedal into floor surface</li> <li>provide a foot pedal that is a low profile design, reducing the need to flex the ankle</li> </ul>		✓  ✓	high  med to high	low  med	med  med

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Increase visual access to work <ul style="list-style-type: none"> <li>light levels should be 100-175 fc for work</li> </ul>		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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## CASE STUDY – Cooking (Food Preparation)

### TASK TITLE: Cooking (Food Preparation)

<b>Task Description:</b>	<p>The Cooking (Food Preparation) task involves all aspects of the preparation of foods. This includes moving boxes and bins of ingredients, cutting ingredients into pieces, as well as moving pans to and from the ovens. Short order grill cooking and preparing baked goods are addressed in the Cooking (Short Order Grill) and Baking case studies, respectively.</p> <p>Typical environments in which the Cooking (Food Preparation) tasks can occur include (but are not limited to) are:</p> <ul style="list-style-type: none"> <li>• Cafeterias and mess halls</li> <li>• Restaurants</li> <li>• Clubs</li> </ul>
<b>Job Performance Measures Most Often Impacted by Cooking: (Food Preparation)</b>	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Hours daily to complete Cooking (Food Preparation) tasks</li> <li>• Taste of food</li> </ul>
<b>Typical Employee Comments about Cooking: (Food Preparation)</b>	<p>Employees typically experience discomfort in the legs/feet and lower back.</p> <p>The back/torso is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	<p>Dynamic Task Analysis, Biomechanical Lifting Analysis</p>

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Work area too high</li> </ul>  <ul style="list-style-type: none"> <li>Items stored too high</li> </ul>	32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>position ingredient prep work near or just above elbow level</li> <li>use an adjustable height table</li> <li>provide height adjustable mixing bowls</li> <li>provide several alternate work height prep tables</li> </ul>	✓		low	med	med
		123. Raise the person <ul style="list-style-type: none"> <li>provide a portable work platform which can be easily stored under the table, out of the way</li> </ul>		✓	med to high	low	low
		123. Raise the person <ul style="list-style-type: none"> <li>provide a footstool or small step</li> </ul>	✓		low	low	low
		32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>place frequently accessed and/or heavy ingredients on shelves between mid-thigh and chest height</li> </ul>	✓		low	low	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>avoid stacking pans above shoulder height in cart racks</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>place frequently accessed and/or heavy ingredients on shelves between mid-thigh and chest height</li> </ul>	✓		low	low	low
				✓			
				✓			

### Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Work too far away	41. Move work piece closer to body	✓				
		• place frequently used items with easy reach			low	low	low
		• modify storage containers to reduce reach requirements		✓	med	med	med
		• provide dispensing mechanisms for ingredients		✓	med to high	med	med
		13. Encourage ergonomic work techniques					
		• slide the work closer before lifting		✓	low	med	low
	• Reaching into oven to place/remove items in back	• use front stove burners for foods requiring considerable attention during cooking		✓	low	med	low
		148. Provide appropriate equipment					
		• install an oven with a vertical or horizontal rotisserie/carousel in order to minimize reaching and bending		✓	high	low	med

## Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/carrying materials	<ul style="list-style-type: none"> <li>Carrying stacks of pans and ingredient cases more than three steps</li> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	48. Provide a cart <ul style="list-style-type: none"> <li>use existing carts</li> <li>provide sufficient number of carts to insure availability</li> </ul>	✓	✓	low med	low low	low med
		4. Change a lifting/carrying task to a rolling or sliding tasks <ul style="list-style-type: none"> <li>provide carts which can be adjusted to bench, shelf and oven heights to minimize lifting</li> </ul>		✓	med	med	high
		126. Reduce carry distance <ul style="list-style-type: none"> <li>arrange storage and work areas to reduce travel distances</li> </ul>	✓		low	med	high
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>eliminate or combine handling tasks</li> <li>transport items in larger quantities instead of handling them individually</li> </ul>	✓ ✓		low to high low to high	med med	high high
		19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		med	high	high
		119. Provide wheels <ul style="list-style-type: none"> <li>install appropriate wheels; select larger wheels for the tile floors.</li> </ul>	✓		med	high	high


### Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓	✓ ✓	low high med	med med med	med med med
	<ul style="list-style-type: none"> <li>Reaching into oven to place/remove items in back</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>install an oven with a vertical or horizontal rotisserie/carousel in order to minimize reaching and bending</li> </ul>		✓	high	low	med
	<ul style="list-style-type: none"> <li>Freezer door is difficult to open</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>perform routine lubrication and maintenance on the freezer door to limit force requirements</li> </ul>	✓		med	low	med
		<ul style="list-style-type: none"> <li>lubricate door hinges</li> </ul>	✓		low	low	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>replace freezer door with an air curtain</li> </ul>		✓	high	low	med


### Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lift</li> <li>Freezer door is difficult to open</li> </ul>	13. Encourage ergonomic work techniques	✓		low		low
		<ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling items</li> </ul>					
		147. Provide alternate container					
		<ul style="list-style-type: none"> <li>contact vendor to request addition of handles or repackaging of contents to increase density</li> </ul>		✓	med	med	med
		35. Maintain tracks, rollers, and movement mechanisms					
		<ul style="list-style-type: none"> <li>perform routine lubrication and maintenance on the freezer door to limit force requirements</li> <li>lubricate door hinges</li> </ul>	✓		med	low	med
			✓		low	low	med
		11. Eliminate unnecessary tasks					
		<ul style="list-style-type: none"> <li>replace freezer door with an air curtain</li> </ul>		✓	high	low	med

### Shoulder/Neck (Cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Location of work too low</li> </ul> 	20. Incorporate rest pauses  124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide a riser or block to raise work surface</li> </ul>	✓		low	low	med
			✓		low	high	high

## Hands/Wrists/Arms


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Cutting ingredients with knife</li> </ul>  <ul style="list-style-type: none"> <li>Repeated movements from stirring or scraping kettles clean</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>a bent handle knife can be appropriate for many slicing and chopping tasks</li> <li>use a food processor to chop ingredients</li> </ul>		✓	med	low	low
				✓	med	low	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>use cooking sprays during cooking</li> <li>soak kettles immediately after use</li> </ul>	✓		low	low	med
			✓		low	low	med
		148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide kettles and other cooking equipment that have non-stick surfaces</li> <li>provide automatic stirring elements or powered mixers for mixing tasks</li> </ul>		✓	med	low	med
				✓	med	low	med




### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Hand manipulating ingredients</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use powered food mixers for as many tasks as possible</li> </ul>	✓		med	low	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage personnel to minimize awkward wrist postures</li> </ul>	✓		low	low	low
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>						
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Fingertip forces used to pry apart pans that are stuck together</li> </ul>	128. Reduce force required to install or remove component	✓		low	low	med
		<ul style="list-style-type: none"> <li>use a small wedge to separate pans</li> <li>a spoon or small pry bar can be used to perform the prying task</li> </ul>	✓		low	low	med


## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Holding pans with a pinch grip</li> </ul> 	3. Change a pinch grip to a power grip <ul style="list-style-type: none"> <li>use a full hand grip on pans when possible</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Holding pans back too far on the handle</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>choke up on handle to improve control of pan</li> </ul>	✓		low	low	low
		94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide handles that are insulated to prevent contact with hot surfaces.</li> </ul>		✓	med	med	med
	<ul style="list-style-type: none"> <li>Hand manipulating ingredients</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use powered food mixers for as many tasks as possible</li> </ul>	✓		med	low	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage personnel to minimize awkward wrist postures</li> </ul>	✓		low	low	low

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Tearing open ingredient boxes and bags</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>use a knife to open boxes and bags</li> </ul>	✓		low	med	med
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a utility razor to open boxes and bags</li> </ul>	✓		low	med	med
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Hard edges on trays, pans and utensils</li> </ul> 	93. Provide appropriate gloves	✓		med	low	low
		9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>use pot holders to avoid exposure to hard edges</li> </ul>	✓		low	low	low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Working in freezers, working with cold ingredients</li> </ul>	93. Provide appropriate gloves <ul style="list-style-type: none"> <li>provide insulated gloves covered by an outer layer of plastic</li> </ul>		✓	med	low	low

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Oven heights, stove heights and storage heights too low</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding tasks <ul style="list-style-type: none"> <li>provide adjustable height carts which can adjust to bench, shelf and oven heights to minimize lifting</li> </ul>		✓	med	med	med
		13. Encourage ergonomic work technique <ul style="list-style-type: none"> <li>use oven rack heights between mid-thigh and mid-chest height whenever possible</li> </ul>	✓		low	low	low
		124. Raise the work piece work/surface <ul style="list-style-type: none"> <li>place frequently accessed and/or heavy ingredients on shelves between mid-thigh and chest height</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Stacking items on low shelves of cart causes awkward bending</li> </ul>	13. Encourage ergonomic work technique <ul style="list-style-type: none"> <li>place frequently accessed and/or heavy ingredients on shelves between mid-thigh and chest height</li> </ul>	✓		low	low	low

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Stacking items on low shelves of cart causes awkward bending</li> <li>Person tends to use the back to lift instead of using the legs to assist in the lift. Check for contributing factors in the workplace</li> </ul>	48. Provide a cart <ul style="list-style-type: none"> <li>provide a cart that has spring loaded shelves (e.g., dish cart) or use a cart which has the bottom shelf removed</li> </ul>	✓		med	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use leg muscles to lift</li> </ul>	✓		med	med	med
			✓		med	med	med
	<ul style="list-style-type: none"> <li>Reaching into oven to place/remove items in back</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>install an oven with a vertical or horizontal rotisserie/carousel in order to minimize reaching and bending</li> </ul>		✓	high	low	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>• Work area layout</li> <li>• Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	130. Reduce the angle a person has to turn to transfer an item					
		<ul style="list-style-type: none"> <li>• for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> </ul>	✓		low to high	low	med
		<ul style="list-style-type: none"> <li>• reposition supplies/materials to reduce twisting</li> </ul>	✓		low to high	low	med
		13. Encourage ergonomic work techniques					
		<ul style="list-style-type: none"> <li>• provide training on ergonomics principles and lifting techniques</li> <li>• encourage person to use legs to pivot when handling a load</li> </ul>	✓		low	low	low
			✓		low	low	low

### Back/Torso (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	147. Provide alternate container <ul style="list-style-type: none"> <li>contact vendor to request addition of handles or repackaging of contents to increase density</li> </ul>		✓	med	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling items</li> </ul>	✓		low	low	low
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Ingredient prep area too low</li> </ul>	83. Provide an adjustable height lift table <ul style="list-style-type: none"> <li>position ingredient prep work near or just above elbow level</li> </ul>	✓	✓	low to med	med	med
		<ul style="list-style-type: none"> <li>provide adjustable height table for ingredient preparation</li> </ul>		✓	high	med	med
		<ul style="list-style-type: none"> <li>provide several alternate work heights</li> </ul>		✓	med	med	med
16. Lifting forces	<ul style="list-style-type: none"> <li>Lifting full pans from the oven.</li> <li>Lifting ingredients from shelves.</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>provide adjustable height carts which adjust to bench, shelf and oven heights to minimize lifting</li> </ul>		✓	med	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to keep load as close to body as possible</li> </ul>	✓		low	med	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> <li>Freezer door is difficult to open</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>		✓	med	med	med
		119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul>		✓	med	med	med
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low high med	high med med	high med med
		35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>perform routine lubrication and maintenance on the freezer door to limit force requirements</li> <li>lubricate door hinges</li> </ul>	✓		med	low	med
			✓		low	low	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>replace freezer door with an air curtain</li> </ul>		✓	high	low	med



### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Prolonged standing</li> </ul> 	52. Provide a footrail or footrest		✓	low to med	low	med

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Standing on a hard surface</li> </ul>	86. Provide an appropriate anti-fatigue mat		✓	med	low	med
		96. Provide appropriate shoe inserts	✓		low	low	med
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>Light levels should be 50fc to 100fc for work</li> </ul>		✓	low to high	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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## CASE STUDY – Cooking (Short Order Grill)


### TASK TITLE: Cooking (Short Order Grill)

<b>Task Description:</b>	<p>The Cooking (Short Order Grill) task occurs in a cafeteria-style environment. In this work situation, the employee uses two primary work surfaces; the food preparation counter and the grill. These work surfaces are usually opposite each other and the employee turns or pivots 180 degrees between the two as needed. Food orders are given to the employee verbally or on order slips that are hung above the food preparation counter. The food/supplies/plates are typically stored under, over and/or to the sides of the grill and food preparation counters. The tools most commonly used include spatulas, knives, brushes, and a scraper for cleaning the grill surface.</p> <p>Typical environments in which the Cooking (Short Order Grill) task occurs can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Cafeteria</li><li>• Dining hall</li></ul>
<b>Job Performance Measures Most Often Impacted by Cooking (Short Order Grill):</b>	<p>Measures of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Speed of service/waiting time for order</li><li>• Quality of food serving/presentation.</li></ul>
<b>Typical Employee Comments about Cooking (Short Order Grill):</b>	<p>Employees typically experience discomfort in the back, shoulders and wrists.</p> <p>The back/torso and shoulders/neck are the body areas that most commonly receive a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	Elemental Task Analysis, Dynamic Task Analysis, Biomechanical Lifting Analysis

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Food order slips are too high and/or too far away</li> <li>Plates and other frequently used items are too high above the work surface</li> </ul>	32. Lower the work piece/work surface		✓	med	low	low
		<ul style="list-style-type: none"> <li>clip the order slips on a lazy susan which is no higher than 50 inches (127 cm) above the floor</li> <li>store plates inside a portable spring loaded plate dispenser (as often is used at the beginning of a buffet)</li> </ul>		✓	high	low	low
	<ul style="list-style-type: none"> <li>Storage shelves are too deep</li> <li>Grill is too large/too deep</li> <li>Cooking on the rear of the grill</li> </ul>	38. Move closer to the work location	✓		low	low	med
		<ul style="list-style-type: none"> <li>avoid using the rear areas of shelves except for infrequently used items; store plates on the forward edge of shelves</li> <li>encourage the employee to avoid using the rear area of the grill whenever possible</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>The scraper tool handle is too short</li> </ul>	24. Increase size of work surface		✓	high	low	low
		<ul style="list-style-type: none"> <li>provide a wide grill surface no deeper than 30 inches (76 cm)</li> </ul>					
		149. Provide appropriate tools	✓		low	low	low
		<ul style="list-style-type: none"> <li>Provide tools with appropriate handle diameters and lengths</li> <li>lengthen the scraper tool handle to prevent reaching when scrapping the rear areas of the grill (make long enough to use two hands, providing leverage)</li> </ul>	✓		low	low	low

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Surface (sill) for placement of finished order is too far away</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>relocate the food preparation table to provide direct access to the sill</li> </ul> 41. Move work piece closer to body <ul style="list-style-type: none"> <li>if the food preparation table must be located under the sill, decrease the depth of the table</li> </ul>	✓   ✓		low  med	low  low	low  low
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Prolonged holding of plate while serving</li> <li>Scraping of grill can require excessive force</li> </ul> 	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>do not hold plate; place plate on grill's side while placing food</li> </ul> 137. Sharpen blades frequently <ul style="list-style-type: none"> <li>keep scraper tool blade sharp</li> </ul> 149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide tools with appropriate handle diameters and lengths</li> <li>lengthen the scraper tool handle to prevent reaching when scraping the rear areas of the grill (make long enough to use two hands, providing leverage)</li> </ul> 11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>encourage the employee to squirt water (with a squirt bottle or sprayer) on grill to "deglaze" prior to scraping; food residue can then be wiped from the grill</li> </ul>	✓  ✓  ✓  ✓	✓	low  low  low med  low	low  low  low low  low	low  low  low med  low


### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Food order slips are too high; employee must look up to read</li> <li>Grill too low</li> </ul>	32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>clip the order slips on a lazy susan which is no higher than 50" (127 cm) above the floor</li> </ul>		✓	med	low	low
		124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>consider raising the grill to slightly above elbow height (40"-45") (102-114 cm)</li> </ul>		✓	med to high	med	med






## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/ repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Repeated or excessive use of spatulas for flipping meat patties or other food items</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>install grill press which cooks meat patties/grilled sandwiches on both sides simultaneously</li> </ul>		✓	high	low	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>alternate hands whenever possible</li> <li>insert spatula under meat patty from the side and flip in a single motion</li> </ul>	✓ ✓		low low	low low	low low
	<ul style="list-style-type: none"> <li>Spreading of dressing or butter on bread using knife or spatula</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>spread melted butter and other soft food products with brushes</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>repeated manual cutting tasks (e.g., slicing/dicing vegetables)</li> </ul>	66. Provide a power tool <ul style="list-style-type: none"> <li>provide a food processor</li> <li>slice/dice frequently used items in small batches</li> </ul>	✓	✓	med low	med med	med med

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Excessive use of aerosol spray oil</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>spread a light coating of oil using a brush</li> </ul>	✓		low	low	low
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Scraping of grill can require excessive force</li> </ul>	137. Sharpen blades frequently <ul style="list-style-type: none"> <li>keep scraper tool sharp</li> </ul>	✓		low	low	low
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide tools with appropriate handle diameters and lengths</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>lengthen the scraper tool handle to prevent reaching when scraping the rear areas of the grill (make long enough to use two hands, providing leverage)</li> </ul>	✓		low	low	med
	<ul style="list-style-type: none"> <li>Cooking tools require pinch grips</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>encourage the employee to squirt water (with a squirt bottle or sprayer) on grill to “deglaize” prior to scraping; food residue can then be wiped from the grill</li> </ul>	✓		low	low	low
		94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide cooking tools with larger grips</li> </ul>	✓		low	low	low


## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Tool has sharp edges</li> </ul> 	93. Provide appropriate gloves  9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>use pot holders to avoid exposure to hard edges</li> </ul>	✓		med	low	low
			✓		low	low	low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Handling of frozen foods is a low frequency task and would not be considered a problem</li> </ul>	N/A					

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Food order slips are too far away</li> <li>Plates are stored too low</li> <li>Storage shelves are too deep</li> <li>Grill is too large/too deep</li> <li>Cooking on the rear of the grill</li> </ul>	32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>clip the order slips on a lazy susan which is no higher than 50 inches (127 cm) above the floor and no further away than 30 inches (76 cm)</li> </ul>		✓	med	low	low
		124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>store plates inside a portable spring loaded plate dispenser (as is often used at a buffet)</li> </ul>		✓	high	low	low
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>avoid using the rear areas of shelves except for infrequently used items; store plates on the forward edge of shelves</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage the employee to avoid using the rear area of the grill whenever possible</li> </ul>	✓		low	low	med
		24. Increase size of work surface <ul style="list-style-type: none"> <li>provide a wide grill surface no deeper than 30 inches (76 cm)</li> </ul>		✓	low	low	low

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>The scraper tool handle is too short</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide tools with appropriate handle diameters and lengths</li> <li>lengthen the scraper tool handle to prevent reaching when scrapping the rear areas of the grill (make long enough to use two hands, providing leverage)</li> </ul>	✓		low	low	low
			✓		low	low	med
	<ul style="list-style-type: none"> <li>Surface (sill) for placement of finished order is too far away</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>relocate the food preparation table to provide direct access to the sill</li> </ul>	✓		low	low	med
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>if the food preparation table must be located under sill, decrease the depth of the table</li> </ul>		✓	med	low	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Person tends to twist with the back instead of moving the entire body</li> </ul>	150. Re-design work space <ul style="list-style-type: none"> <li>Re-design work space so that adjacent work surfaces are at right angles to each other or are placed so that the aisle between is not greater than 42 inches</li> </ul>		✓	high	low	med
		67. Provide a powered cart <ul style="list-style-type: none"> <li>Provide a cart with swiveling casters to hold and move food products between work surfaces.</li> </ul>		✓	high	low	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and proper body mechanics</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to move the feet instead of reaching/twisting between the two work surfaces</li> </ul>	✓		low	low	low
14. High speed, sudden movements <u>or</u> Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>approach vendor to request packaging that is easier to handle</li> </ul>		✓	low to high	low	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>use slow controlled movements</li> </ul>	✓		low	low	low

### Back/Torso (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Prolonged leaning over the work surface</li> </ul>	124. Raise the work piece/work surface					
		<ul style="list-style-type: none"> <li>place the grill on blocks/increase height</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>raise the food preparation table on blocks</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>install adjustable height legs to the food preparation table</li> </ul>		✓	med	low	low
		13. Encourage ergonomic work techniques					
16. Lifting forces	<ul style="list-style-type: none"> <li>Lifting full pans to/from the oven and lifting ingredients from shelves</li> <li>Handling oil</li> </ul>	<ul style="list-style-type: none"> <li>encourage the person to stand up straight periodically during the job</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage the person to lean on one arm/hand while reaching with the other</li> </ul>	✓		low	low	low
		4. Change a lifting/carrying task into a rolling or pushing task		✓	med	med	med
		<ul style="list-style-type: none"> <li>provide adjustable height cards which adjust to bench, shelf and oven heights to minimize lifting</li> </ul>					
		13. Encourage ergonomic work techniques					
		<ul style="list-style-type: none"> <li>encourage person to keep load as close to body as possible</li> </ul>	✓		low	med	med
		151. Reduce the weight of the load placed on the cart					
		<ul style="list-style-type: none"> <li>talk with vendor regarding smaller or lighter containers</li> </ul>	✓		low	med	med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>remove or replace broken or missing wheels</li> <li>remove debris between caster and coupling</li> <li>check bearings and tread composition to ensure ability to meet loading and movement requirements</li> </ul>	✓		low	med	med
			✓		low	med	med
			✓		low	low	low
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	119. Provide wheels		✓	med	low	low
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓		low	med	med
			✓	✓	high	med	med
	<ul style="list-style-type: none"> <li>Heavy/difficult to open door</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>replace freezer door with an air curtain</li> <li>repair freezer doors</li> </ul>	✓		high	low	med
				✓	low	med	med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					



## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Prolonged work in a standing position</li> </ul>	12. Incorporate rest pauses  25. Increase task variety	✓  ✓		low  low	low  low	low  low
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Standing on a hard surface</li> </ul> 	96. Provide appropriate shoe inserts  86. Provide an appropriate anti-fatigue mat <ul style="list-style-type: none"> <li>provide matting designed for a food service environment and for ease of cleaning; matting should cover the entire floor surface between the grill and the food preparation surfaces</li> </ul> 143. Wear appropriate shoes	✓       ✓	✓	low  med    low	low  med    low	low  low    low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					


## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>Light level should be 75fc to 100fc for work</li> </ul>		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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<b>CASE STUDY - Dishwashing</b>	
<b>TASK TITLE: Dishwashing</b>	
<b>Task Description:</b>	<p>The Dishwashing task involves cleaning pots, pans, plates, silverware and/or trays. The task can involve a combination of scrubbing by hand and stacking items in wash rack trays.</p> <p>Typical environments in which the Dishwashing task occurs can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Cafeterias and mess halls</li> <li>• Restaurants</li> <li>• Clubs</li> </ul>
<b>Job Performance Measures Most Often Impacted by Dishwashing:</b>	<p>Measures of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Hours daily to complete washing</li> <li>• Cleanliness of plates</li> </ul> <p>These are not formal measures currently in use.</p>
<b>Typical Employee Comments about Dishwashing:</b>	<p>Employees typically experience discomfort in the lower back and shoulders. They generally attribute this discomfort to lifting and handling items.</p> <p>The back/torso is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	Dynamic Task Analysis, Biomechanical Lifting Analysis, Push/Pull Force Analysis


## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Reach distance for pulling tray from conveyor</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>relocate the worker to the end of the conveyor to avoid reaching across intervening surface</li> </ul>	✓		low	med	med
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>reduce the width of the sort area</li> <li>design conveyor to flow directly to personnel with little or no intervening counter</li> </ul>		✓	med to high	med	med
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a “rake” type tool to pull dishes</li> </ul>		✓	med to high	high	med
				✓	low to med	low	low
	<ul style="list-style-type: none"> <li>Reach when flipping and aligning trays</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>use consistent, standard size trays</li> </ul>		✓	low to high	high	med
	<ul style="list-style-type: none"> <li>Height of dishwasher door when opening and closing</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>install an auto open and close door sequencer</li> </ul>		✓	med to high	low	med

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Height of dishwasher door when opening and closing (continued)</li> <li>Throwing trash in garbage can</li> </ul>	32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>provide a rope extension to minimize vertical reaching</li> </ul> 38. Move closer to the work location <ul style="list-style-type: none"> <li>relocate trash cans</li> <li>provide trash cans with wheels</li> </ul>	✓  ✓	✓  ✓	low to med  low med	low  med med	med  med med
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Carrying stacks of plates and pans</li> </ul>	48. Provide a cart <ul style="list-style-type: none"> <li>use existing carts</li> <li>use carts with spring loaded bottoms to accommodate greater loads</li> </ul> 4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>change the work process to keep wash areas closer together in order to minimize carrying objects</li> </ul>	✓	✓  ✓	low med to high  low to high	low low  med	med med  med

## Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Lifting full dish trays from washer to cart</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>reduce the height of the wash basins to allow the dish trays to slide onto carts -a sloping surface could limit water spilling on the floor while allowing easy lift over</li> </ul>		✓	med	med	med
	<ul style="list-style-type: none"> <li>Pulling dish trays along washer</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>keep the bottom edges of the trays smooth</li> <li>install Teflon feet on the bottoms of the trays to ease movement</li> </ul>		✓  ✓	low to med low to med	low low	med med
	<ul style="list-style-type: none"> <li>Opening and closing washer door</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>perform routine lubrication and maintenance on the sliding door to limit force requirements</li> </ul>	✓		low to med	low	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>install an auto open and close door sequencer</li> </ul>		✓	med to high	low	med

### Shoulder/Neck (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	19. Improve wheel condition		✓	med	med	med
		<ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>					
	<ul style="list-style-type: none"> <li>Cart or piece of equipment is too heavy to be pushed manually</li> </ul>	119. Provide wheels		✓	med	med	med
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	151. Reduce weight of the load placed on the cart	✓		low	low	low
		<ul style="list-style-type: none"> <li>reduce number of items or weight of items on cart</li> </ul>					
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	17. Improve floor condition					
		<ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low high med	med med med	med med med
	<ul style="list-style-type: none"> <li>Scrubbing and scraping pots</li> </ul>	128. Reduce force required to install or remove component					
		<ul style="list-style-type: none"> <li>soak pots repeatedly in warm, soapy water. Wipe the pots every few minutes to loosen residues</li> </ul>	✓		low	med	high
		<ul style="list-style-type: none"> <li>provide high friction surface to stabilize pots while scrubbing</li> </ul>		✓	low to med	med	med



### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Opening and closing washer door</li> <li>Scrubbing and scraping pots</li> <li>Throwing trash in garbage can</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms	✓		low to med	low	high
		<ul style="list-style-type: none"> <li>perform routine lubrication and maintenance on the sliding door to limit force requirements</li> </ul>					
		128. Reduce force required to install or remove component	✓		low	med	high
		<ul style="list-style-type: none"> <li>soak pots repeatedly in warm, soapy water. Wipe the pots every few minutes to loosen residues</li> <li>provide high friction surface to stabilize pots while scrubbing</li> </ul>		✓	low to med	med	med
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Location of work too low for good visual access, yet desirable height for arm forces applied.</li> </ul>	38. Move closer to the work location	✓		low	med	med
		<ul style="list-style-type: none"> <li>relocate trash cans</li> <li>provide trash cans with wheels</li> </ul>		✓	low med	med med	med med
		12. Incorporate rest pauses	✓		low	med	med
		83. Provide an adjustable height lift table	✓		low to med	med	med
		<ul style="list-style-type: none"> <li>provide a riser to raise the level of the work</li> <li>provide adjustable height work surfaces</li> </ul>		✓	med to high	med	med

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Repeated movements from scrubbing and scraping pots</li> <li>Repeated movements sorting silverware and plates into bins</li> </ul> 	128. Reduce force required to install or remove component		✓	low to high	med	high
		<ul style="list-style-type: none"> <li>soak pots repeatedly in warm, soapy water. Wipe the pots every few minutes to loosen residues</li> <li>provide high friction surface to stabilize pots while scrubbing</li> </ul>	✓		low	med	high
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>institute a customer sort procedure to reduce sorting in the dish room</li> </ul>		✓	low to med	med	med
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Repeated movements sorting silverware and plates into bins</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	low
		• encourage personnel to maintain a neutral wrist position					
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Repeated movements sorting silverware and plates into bins</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>institute a customer sort procedure to reduce sorting in the dish room</li> </ul>		✓	low to high	med	high

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Handling multiple plates in one hand</li> </ul>	13. Encourage ergonomic work techniques					
		<ul style="list-style-type: none"> <li>use a two-handed transfer</li> <li>remove one plate at a time and stack beside tray, transfer stack to the cart</li> </ul>	✓ ✓		low low	med med	med med
		<ul style="list-style-type: none"> <li>avoid handling large stacks of dishes all at once</li> </ul>	✓		low	med	med
		142. Use two or more persons to perform the transfer	✓		low	med	med
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Scrubbing and scraping pots</li> <li>Forces from handling multiple plates in one hand</li> </ul>	128. Reduce force required to install or remove component	✓		low	med	high
		<ul style="list-style-type: none"> <li>soak pots repeatedly in warm, soapy water. Wipe the pots every few minutes to loosen residues</li> <li>provide high friction surface to stabilize pots while scrubbing</li> </ul>		✓	low to med	med	med
		13. Encourage ergonomic work techniques					
		<ul style="list-style-type: none"> <li>use a two-handed transfer</li> <li>remove one at a time and stack beside tray, transfer stack to the cart</li> </ul>	✓ ✓		low low	med med	med med
		<ul style="list-style-type: none"> <li>avoid handling large stacks of dishes all at once</li> </ul>	✓		low	med	med
		142. Use two or more persons to perform the transfer	✓		low	med	med


### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Fingertip forces from prying apart pans that are stuck together</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use a small wedge to separate pans</li> <li>use a spoon or small pry bar to perform the prying task</li> </ul>	✓  ✓		low  low	low  low	low  low
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Opening and closing washer door</li> <li>Scrubbing and scraping pots</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>perform routine lubrication and maintenance on the sliding door to limit force requirements</li> </ul> 128.Reduce force required to install or remove component <ul style="list-style-type: none"> <li>soak pots repeatedly in warm, soapy water. Wipe the pots every few minutes to loosen residues</li> <li>provide high friction surface to stabilize pots while scrubbing</li> </ul>	✓    ✓	    ✓	low to med   low  low to med	low  med  med	high   high  med
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Hard edges from handling trays, pans and utensils</li> </ul>	93. Provide appropriate gloves	✓		low	low	low
11. Hands/fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Reach distance for pulling tray from conveyor</li> <li>Reaching under sink to retrieve dish trays</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>relocate the worker to the end of the conveyor to avoid reaching across intervening surface</li> </ul>	✓		low	med	med
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>reduce the width of the sort area</li> <li>design conveyor to flow directly to personnel with little or no intervening counter</li> </ul>	✓	✓	high high	med med	med med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>institute a customer sort procedure to reduce sorting in the dish room</li> </ul>		✓	low to high	med	high
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a rake type tool to pull dishes</li> </ul>		✓	low to med	low	low
		37. Modify facilities to decrease handling <ul style="list-style-type: none"> <li>Install shelves that roll out for easy access</li> </ul>		✓	low to med	low	med
		147. Provide an alternate container <ul style="list-style-type: none"> <li>use a cart with a spring loaded base for storing dish trays</li> </ul>		✓	med	low	med



## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Stacking items on low cart causes awkward bending</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>use a cart with a spring loaded base</li> </ul>		✓	med	low	med
	<ul style="list-style-type: none"> <li>Person tends to use the back to lift instead of using the legs to assist in the lift (check for contributing factor in the workplace)</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use leg muscles to lift</li> </ul>	✓		low	med	low
			✓		low	med	low
	<ul style="list-style-type: none"> <li>Sink too low</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide a false bottom insert into sink to raise the work</li> <li>raise the sink</li> </ul>	✓		low to med med to high	low high	low high
							

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Work area layout</li> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	130. Reduce the angle a person has to turn to transfer an item <ul style="list-style-type: none"> <li>if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> <li>increase space slightly between starting and ending points to encourage use of legs to turn</li> </ul>	✓		low to med	low	med
			✓		low to med	low	med
		12. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use legs to pivot when handling a load</li> </ul>	✓		low	med	low
			✓		low	med	low
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> <li>Slippery floors</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>use a cart to minimize carrying wet items across floor</li> </ul>	✓		low	med	low
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling items</li> </ul>	✓		low	med	med
		17. Improve floor condition <ul style="list-style-type: none"> <li>provide a non-slip walking surface that drains effectively and is easy to clean</li> </ul>		✓	med to high	low	med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Bending into sink to reach/scrub pans</li> </ul> 	79. Provide a work surface which is adjustable in height <ul style="list-style-type: none"> <li>provide a false bottom insert into sink to raise the work</li> <li>raise the sink</li> </ul>	✓	✓	low to med  med to high	low  high	low  high
16. Lifting forces	<ul style="list-style-type: none"> <li>Lifting full dish trays from washer to cart</li> </ul> 	4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>reduce the lift over height on the edge of the wash basins to allow the dish trays to slide onto carts - a sloping surface could limit water spilling on the floor while allowing easy lift over</li> </ul>		✓	med	med	med



### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> <li>Cart or piece of equipment is too heavy to be pushed manually</li> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul>		✓	med	med	med
		19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		med	med	med
		151. Reduce the weight of the load placed on the cart <ul style="list-style-type: none"> <li>reduce number of items or weight of items on cart</li> </ul>	✓		low	med	low
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low med high	med med med	high high high
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Prolonged standing</li> </ul>	20. Incorporate rest pauses	✓		low	med	med
		25. Increase task variety	✓		low	med	med
		52. Provide a footrail or footrest		✓	low to med	low	med
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Standing on a hard surface</li> </ul>	96. Provide appropriate shoe inserts	✓		low to med	low	med
		86. Provide an appropriate anti-fatigue mat <ul style="list-style-type: none"> <li>matting should drain well and be easy to clean</li> </ul>		✓	med to high	med	med
		143. Wear appropriate shoes	✓		low	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Lack of legroom</li> </ul>	132. Remove obstructions	✓		low	med	med
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Lack of foot room</li> </ul>	132. Remove obstructions	✓		low	med	med

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>Light levels should be 50 fc – 100 fc for work</li> </ul>		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					


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## CASE STUDY – Food Serving

### TASK TITLE: Food Serving

<b>Task Description:</b>	<p>The Food Serving task occurs in a cafeteria-style environment. In this work situation, the employee typically stands behind a long service counter, which contains large heated stainless steel containers of food. Customers may request any combination of menu items from these containers. The employee serves the food onto a plate or “carry out” container using a combination of ladles, serving forks, scoops, tongs, or spatulas, and hands the plate to the customer. The customer then either places the plate on a cafeteria tray or carries the plate to the next station or check out. In this work situation, the food server’s task does not include preparation of grilled items but may include replacing large containers of food into the heated service counter and replacing food items on a salad bar. Refer to Case Study 5 - Cooking (Short Order Grill).</p> <p>Typical jobs in which the Food Serving task occurs can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Cafeteria</li> <li>• Dining Hall</li> </ul>
<b>Job Performance Measures Most Often Impacted by Food Serving:</b>	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Speed of service/waiting time (in queue)</li> <li>• Quality of Food Serving/presentation</li> </ul>
<b>Typical Employee Comments about Food Serving:</b>	<p>Employees typically experience discomfort in the shoulders, wrists and back.</p> <p>The shoulders/neck and hand/ wrists/arms are the body areas that most commonly receive a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	<p>Elemental Task Analysis, Dynamic Task Analysis, Biomechanical Lifting Analysis.</p>

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Food is too far away/food containers are too long</li> </ul> 	94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide serving tools with longer handles; server should be able to scoop food from the far end of the container with a relaxed reach</li> </ul>	✓		low	low	low
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>eliminate placement of self-service items in a center row; keep self-service items (which must be restocked) around the perimeter</li> <li>place high demand food items closest to server's primary work position</li> </ul>	✓		low	med	med
			✓		low	low	low
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide shorter ladles for serving soup</li> </ul>	✓		low to med	med	med
		123. Raise the person <ul style="list-style-type: none"> <li>provide a stable platform to raise the person/make the platform as wide as the expected side to side movement of the server</li> <li>provide a temporary step for placing or replacing items into the serving counter or salad bar</li> </ul>	✓		low	med	med
	<ul style="list-style-type: none"> <li>Ladles are too long. This causes reaching with the hand holding the bowl</li> <li>Counter is too high</li> </ul>						

### Shoulder/Neck (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Glass barrier/upper counter is too high to reach over for transferring plate to customer</li> <li>Supplies are stored too high</li> </ul>	82. Provide adequate work space <ul style="list-style-type: none"> <li>provide a “pass through” in the glass barrier – eliminate the need to reach over the top</li> </ul>		✓	med	low	low
		32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>bring materials down to a lower level</li> <li>store smaller quantities of supplies in the work station</li> </ul>	✓	✓	low	low	med
					low	low	med
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Prolonged holding of plate while serving</li> <li>Prolonged holding/carrying of full/replacement hot food containers</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>do not hold plate; place plate on service counter while dispensing food items</li> </ul>	✓		low	low	low
		48. Provide a cart <ul style="list-style-type: none"> <li>transport large food containers on carts; lift the full container only after the empty container has been removed from the service counter</li> </ul>		✓	med	low	low
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Inadequate head room/access to salad bar causes awkward postures while replacing food items</li> </ul>	82. Provide adequate work space <ul style="list-style-type: none"> <li>place popular items nearest the outside edge of the salad bar</li> <li>modify glass shields such that they may be removed or pivoted out of the way during food replacement</li> </ul>	✓	✓	low med to high	med med	med med



## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Repeated or excessive use of ladles for serving soup or dispensing gravy</li> <li>Inappropriate tongs design can create awkward wrist postures</li> </ul> 	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>transfer soup pots to self service area</li> </ul>		✓	high	low	high
		25. Increase task variety <ul style="list-style-type: none"> <li>avoid prolonged use of ladle by alternative work/serving positions with another employee</li> </ul>	✓		low	low	low
		77. Provide a tool with an appropriate handle angle <ul style="list-style-type: none"> <li>purchase a variety of tongs (e.g., straight handle-to-prongs design, 90 degree handle-to-prongs design, etc.)</li> </ul>	✓		low to med	low	low

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Lack of handles on food containers requires bent wrist grip</li> </ul>	147. Provide an appropriate container <ul style="list-style-type: none"> <li>add handles to current food containers</li> <li>purchase food containers with appropriate (and insulated) handles</li> </ul> 13. Encourage ergonomic work techniques	✓	✓  ✓	med  med to high  low	low  low  low	low  low  low
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Making sandwiches</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>create a self-serve sandwich bar</li> </ul> 25. Increase task variety	✓	✓	med to high low	med low	med med
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Excessive use of “ice cream” type scoop for dispensing food (e.g., mashed potatoes) involves a thumb operated trigger</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use deep spoon to replace trigger-assisted “ice cream” type scoop</li> </ul>	✓		low	low	low


### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Excessive use of “ice cream” type scoop for dispensing food (e.g., mashed potatoes) involves a thumb operated trigger (continued)</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>use spatula, water or other device (as appropriate) to remove food items that stick</li> </ul>	✓		low	low	low
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Food containers are heavy and/or are difficult to grasp</li> <li>Serving tools require pinch grips</li> </ul>	131. Reduce weight of work piece <ul style="list-style-type: none"> <li>approach vendor regarding lighter weight containers</li> </ul>		✓	high	low	low
		94. Provide appropriate handles <ul style="list-style-type: none"> <li>add handles to current food containers</li> <li>purchase food containers with appropriate (and insulated) handles</li> </ul>		✓	med	low	low
				✓	med to high	low	low
		88. Provide an appropriate handle diameter <ul style="list-style-type: none"> <li>provide serving tools with larger grips; grips should be insulated or sized to compensate for the use of gloves</li> </ul>		✓	low to med	low	low
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Server technique/banging serving tool to remove food (e.g., removing grounds from espresso steamer, removing mashed potatoes from spoon)</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide serving tools with non-stick surfaces</li> </ul>		✓	med	low	low

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Hard edge of handles</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide serving tools with rounded surfaces</li> </ul>	✓		low to high	low	low
		94. Provide appropriate handles <ul style="list-style-type: none"> <li>add handles to current food containers</li> </ul>		✓	med	low	low
		<ul style="list-style-type: none"> <li>purchase food containers with appropriate (and insulated) handles</li> </ul>		✓	med to high	low	low
		88. Provide an appropriate handle diameter <ul style="list-style-type: none"> <li>provide serving tools with larger grips; grips should be insulated or sized to compensate for the use of gloves</li> </ul>		✓	low to med	low	low
11. Hand and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Metal handles on tools</li> <li>Serving and stocking cold bar</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide tools with insulated handles</li> </ul>	✓		low to med	low	low
		25. Increase task variety	✓		low	low	low
		11. Eliminate unnecessary tasks	✓		low	low	low

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Food containers on carts are too low</li> <li>Food items are too far away</li> </ul> 	83. Provide an adjustable height lift table	✓		low	low	low
		<ul style="list-style-type: none"> <li>eliminate placement of food containers (e.g., salad bar containers) on lower level of carts; use only the top level</li> </ul>					
		94. Provide appropriate handles	✓		low	low	low
		<ul style="list-style-type: none"> <li>provide serving tools with longer handles; server should be able to scoop food from the far end of the container with a relaxed reach</li> </ul>					
		41. Move work piece closer to body	✓		low	low	med
		<ul style="list-style-type: none"> <li>place high demand food items closest to server's primary work position</li> <li>eliminate placement of self-service items in a center row; keep self-service items (which must be restocked) around the perimeter</li> </ul>	✓		low	low	med
		147. Provide an appropriate container		✓	med	low	low
		<ul style="list-style-type: none"> <li>replace rectangular food containers with square ones</li> </ul>					

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person tends to use the back to lift instead of using the legs to assist in the lift (check to make sure that there is no contributing factor in the work place)</li> </ul>	13. Encourage ergonomics work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use leg muscles to lift</li> </ul> 48. Provide a cart <ul style="list-style-type: none"> <li>provide a cart with a spring loaded bottom</li> </ul>	✓  ✓	✓	low  low  med	low  low  low	low  low  low
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Person tends to twist with the back instead of moving the entire body</li> </ul>	13. Encourage ergonomics work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and proper body mechanics</li> <li>encourage person to move the entire body instead of reaching/twisting for items that are not directly in front</li> </ul> 48. Provide a cart <ul style="list-style-type: none"> <li>provide a cart with a spring loaded bottom</li> </ul> 150. Re-design work space <ul style="list-style-type: none"> <li>re-design work space so that adjacent work surfaces are placed at 90 degrees to one another</li> </ul>	✓  ✓	✓  ✓	low  low  med  med	low  low  low  low	low  low  low  med

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed sudden movements or lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion while replacing food containers</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth controlled motions while handling items</li> </ul>	✓		low	low	low
		131. Reduce weight of work piece <ul style="list-style-type: none"> <li>approach vendor regarding lighter weight containers</li> </ul>		✓	high	low	low
15. Static awkward back postures	<ul style="list-style-type: none"> <li>Prolonged leaning over the food service or salad bar while doing food replacement or interim cleaning</li> </ul>	82. Provide adequate work space <ul style="list-style-type: none"> <li>provide access to all sides of the salad bar; avoid placement of bar against the wall</li> <li>purchase salad bar with a “U-shaped” design; interior access can be used for re-stocking</li> </ul>		✓	low	med	med
				✓	high	high	high
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage the person to stand up straight periodically during the job</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage the person to lean on one arm/hand while reaching with the other</li> </ul>	✓		low	low	low

### Back/Torso (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Lifting forces	<ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>provide smaller food containers</li> </ul>		✓	high	low	low
		94. Provide appropriate handles <ul style="list-style-type: none"> <li>add handles to current food containers</li> </ul>		✓	med	low	low
		<ul style="list-style-type: none"> <li>purchase food containers with appropriate (and insulated) handles</li> </ul>		✓	high	low	low
		48. Provide a cart <ul style="list-style-type: none"> <li>provide an adjustable height cart for transporting replacement food containers; adjust cart height so that container may be slid off and into position (instead of being lifted)</li> </ul>		✓	high	med	med
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		med	med	med
		119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul>		✓	med	med	med




### Back/Torso (cont.)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		151. Reduce weight of the load placed on the cart • reduce number of items or weight of items on cart	✓		low	med	low
		17. Improve floor condition • improve housekeeping • repair cracks or gaps in floor • provide ramps to compensate for minor differences in floor height	✓ ✓	✓	low high med	med med med	med high high
18. Whole body vibration	• Rarely occurs	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Prolonged standing position</li> </ul>	20. Incorporate rest pauses	✓		low	low	low
		52. Provide a footrail or foot rest		✓	med	low	low
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Standing on a hard surface</li> </ul> 	86. Provide appropriate anti-fatigue matting		✓	med	low	low
		96. Provide appropriate shoe inserts	✓		low	low	low
		143. Wear appropriate shoes	✓		low	low	low

### Legs/Feet (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Lack of leg room</li> </ul> 	80. Provide adequate leg clearance		✓	med to high	med	med
		132. Remove obstructions	✓		low	med	med
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Lack of foot room</li> </ul>	81. Provide appropriate toe clearance		✓	med to high	med	med
		132. Remove obstructions	✓		low	med	med

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work increase light levels 50fc-100fc for work		✓	low to high	med	med
24. Intensive visual tasks, staring at work object for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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## CASE STUDY - Fork Truck Operation (sitting)

### TASK TITLE: Fork Truck Operation (sitting)

<b>Task Description:</b>	<p>The Fork Truck Operation (sitting) task primarily involves driving in a sitting position. This type of truck is most commonly associated with transferring pallets of stock from one location to another, or with loading and unloading trailers. The driver must often drive backwards and twist and look over the rear of the truck to see. Loading/Unloading and Picking/Stocking are addressed in the Loading/Unloading and Picking/Stocking case studies, respectively.</p> <p>Typical environments in which the Fork Truck Operation (sitting) task occurs can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Pallet transport/transfer</li><li>• Loading/unloading trailers</li><li>• General warehouse material handler.</li></ul>
<b>Job Performance Measures Most Often Impacted by Fork Truck Operation (sitting):</b>	<p>While no formal process has been established to measure quality driving performance, productivity measures may sometimes include:</p> <ul style="list-style-type: none"><li>• Number of loads or trailers per day.</li></ul>
<b>Typical Employee Comments about Fork Truck Operation (sitting):</b>	<p>Employees typically experience discomfort and/or stiffness in the low back, shoulders/neck, and legs/feet.</p> <p>The back/torso is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	Postural Analysis, Vibration Analysis

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Control levers/steering wheel too far away</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>move seat forward</li> <li>add backrest pad if seat cannot be moved forward</li> </ul>	✓ ✓		low low	low low	low low
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Pulling control levers is difficult due to poor lever maintenance or poor lever design</li> <li>Turning steering wheel is difficult due to poor maintenance or poor design (e.g., non-powered)</li> </ul>	101. Provide appropriate controls which do not require excessive force <ul style="list-style-type: none"> <li>contact supplier to investigate adjustable and/or smoother traveling levers</li> </ul>		✓	high	low	med
		67. Provide a powered cart <ul style="list-style-type: none"> <li>contact supplier to investigate power steering</li> </ul>		✓	high	low	med
		35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>maintain equipment to reduce forces associated with lever action and steering</li> </ul>	✓		low to med	low	low

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Work location/path of travel located behind operator</li> <li>Fixed position of the seat requires extreme twist</li> </ul>	147. Provide an alternate container	✓		low	med	med
		<ul style="list-style-type: none"> <li>reduce the height of pallet loads when practical</li> </ul>					
		13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage the operator to shift his/her whole body rather than just the head/neck</li> </ul>					
		87. Provide an appropriate chair/stool		✓	med	low	med
		<ul style="list-style-type: none"> <li>contact supplier to investigate acquiring the option of swivel (rotate to between 45 and 90 degrees of a fixed position) seat for use when driving backwards (Note: steering contents will stay fixed but swiveling seat allows for a more “neutral” neck position)</li> </ul>	✓		low	low	low
		20. Incorporate rest pauses	✓		low	low	low
		25. Increase task variety					



## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Fork truck control lever location too high or is at an inappropriate angle</li> </ul>	123. Raise the person <ul style="list-style-type: none"> <li>adjust the chair height</li> <li>add a cushion to the seat</li> </ul> 101. Provide appropriate controls which do not require excessive force <ul style="list-style-type: none"> <li>contact supplier to investigate adjustable levers or speed knob option to improve wrist posture</li> </ul>	✓ ✓	✓	low low  low to med	low low  low	low low  med
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Pulling control levers is difficult due to poor lever maintenance or poor lever design</li> <li>Turning steering wheel is difficult due to poor maintenance or poor design (e.g., non-powered)</li> </ul>	101. Provide appropriate controls which do not require excessive force		✓	high	low	med
		<ul style="list-style-type: none"> <li>contact supplier to investigate adjustable and/or smoother traveling levers</li> </ul>					
		67. Provide a powered cart		✓	high	low	med
		<ul style="list-style-type: none"> <li>contact supplier to investigate power steering</li> </ul>					
		35. Maintain tracks, rollers, and movement equipment	✓		low to med	low	low
		<ul style="list-style-type: none"> <li>maintain equipment to reduce forces associated with lever action and steering</li> </ul>					
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Control levers or steering wheel transfers excessive vibration</li> </ul>	101. Provide appropriate controls which do not require excessive force		✓	high	low	low
		<ul style="list-style-type: none"> <li>provide levers and steering wheels that include vibration dampening materials</li> </ul>					
		35. Maintain tracks, rollers, and movement equipment	✓		low	low	low
		<ul style="list-style-type: none"> <li>keep fork trucks in top condition and conduct vibration measurement when appropriate</li> </ul>					


### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Hard edges on steering wheel</li> </ul>	54. Provide a high friction gripping surface <ul style="list-style-type: none"> <li>provide a compressible wrap for the steering wheel</li> </ul>	✓		low to med	low	low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> </ul>	23. Increase room temperature	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage employees to keep doors shut</li> <li>provide portable heaters near trailers</li> <li>provide and use adjustable seals around individual trailer bays</li> </ul>		✓	med	low	low
				✓	high	low	low
		93. Provide appropriate gloves	✓		low	low	low
		12. Encourage appropriate seasonal clothing	✓		low	low	low

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Control levers positioned too far away</li> <li>Driver cannot reach foot pedals without sitting on the forward edge of the seat and leaning forward</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>move seat forward</li> <li>add backrest pad if seat cannot be moved forward</li> </ul>	✓ ✓		low low	low low	low low
		101. Provide alternative controls which do not require excessive force <ul style="list-style-type: none"> <li>contact supplier to investigate adjustable foot pedals or foot pedal extensions</li> <li>add blocks or extensions to current footpedals</li> </ul>	✓	✓	med low	low low	med med
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Work location/path of travel located behind operator</li> <li>Fixed position of the seat requires extreme twist</li> </ul>	87. Provide an appropriate chair/stool <ul style="list-style-type: none"> <li>contact supplier to investigate acquiring the optional swivel (rotate to between 45 and 90 degrees to a fixed position) seat for use when driving backwards</li> </ul>	✓	✓	med low	low low	med low
		20. Incorporate rest pauses	✓		low	low	low
		25. Increase task variety					

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements <u>or</u> Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Inadequate chair/seat design and/or adjustment</li> </ul>  <ul style="list-style-type: none"> <li>Prolonged driving</li> <li>Control levers positioned too far away</li> </ul>	<p>87. Provide an appropriate chair/stool</p> <p>115. Provide support for the lower back</p> <ul style="list-style-type: none"> <li>adjust back support forward</li> <li>encourage person to sit upright and let the backrest support the body</li> <li>add a backrest cushion</li> </ul> <p>20. Incorporate rest pauses</p> <p>25. Increase task variety</p> <p>38. Move closer to the work location</p> <ul style="list-style-type: none"> <li>move seat forward</li> <li>add backrest pad if seat cannot be moved forward</li> </ul>	<p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p> <p>✓</p>	<p>✓</p>	<p>med</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p>	<p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p>	<p>med</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p> <p>low</p>

### **Back/Torso (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Control levers positioned too far away (continued)</li> </ul>	101. Provide appropriate controls which to not require excessive force <ul style="list-style-type: none"> <li>contact supplier to investigate adjustable foot pedals or foot pedal extensions</li> <li>add blocks or extensions to current foot pedals</li> </ul>	✓	✓	med  low	low  low	med  med
15. Lifting forces	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
16. Pushing or pulling	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> <li>Poor design and/or maintenance of seat and mounting may increase vibration transmission between the truck and the driver</li> <li>Floor/surface condition causes shock or high forces during transport</li> </ul>	87. Provide an appropriate chair/stool <ul style="list-style-type: none"> <li>seat/mounting should incorporate the use of shock and vibration absorbing devices</li> </ul> 35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>keep fork trucks in top condition and conduct vibration measurement when appropriate</li> </ul> 17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> </ul>	✓       ✓ ✓	✓	med    low  low high	low    low  low low	med    low  low med

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"><li>Rarely occurs</li></ul>	N/A					
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"><li>Hard edge or seat may create pressure point on underside of thighs</li></ul>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"><li>use an additional seat cushion; cut padding and recover the seat pan to create a waterfall or downward curve to the front edge of the seat</li></ul>	✓		low	low	low
		87. Provide an appropriate chair/stool <ul style="list-style-type: none"><li>investigate replacing/improving vehicle seats</li></ul>		✓	high	low	high
21. Awkward leg postures	<ul style="list-style-type: none"><li>Rarely occurs</li></ul>	N/A					
22. Awkward foot postures	<ul style="list-style-type: none"><li>Foot pedals are too far away or are at an inappropriate angle for the driver</li></ul>	101. Provide appropriate controls which do not require excessive force	✓	✓	med	low	med
		<ul style="list-style-type: none"><li>contact supplier to investigate adjustable foot pedals or foot pedal extensions</li><li>attach blocks or extensions to current foot pedals in order to change the pedal height and angle</li></ul>			low	low	med
		38. Move closer to the work location <ul style="list-style-type: none"><li>move seat forward</li><li>add backrest pad if seat cannot be moved forward</li></ul>			low low	low low	low low

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Dimly lit trailers increase potential for accidents</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>Light levels should be 50fc to 75fc for work</li> <li>provide spot light to illuminate trailer contents</li> </ul>		✓  ✓	low to med med	med  med	med  med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					



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## CASE STUDY - Fork Truck Operation (standing)

### TASK TITLE: Fork Truck Operation (standing)

<b>Task Description:</b>	<p>The Fork Truck Operation (standing) task primarily requires the driver to stand while operating the lift truck. This type of truck is most commonly associated with obtaining stock from pick tunnels in a warehouse setting. This driving task may also include the use of standing trucks known as “mules” which may be used to push or pull carts and/or transport palletized loads. This case study does not include lifting tasks associated with obtaining stock from pick tunnels. For lifting tasks associated with picking stock from pick tunnels, please see Case Study 17 – Picking/Stocking. Also refer to Case Study 11 – Loading and Unloading, or Case Study 22 – Lifting.</p> <p>Typical environments in which the standing driving task occurs include (not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Stock picker/pick tunnel</li><li>• General warehouse material handler.</li></ul>
<b>Job Performance Measures Most Often Impacted by Fork Truck Operation (standing):</b>	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Pick rate</li><li>• Number of loads per day.</li></ul>
<b>Typical Employee Comments about Fork Truck Operation (standing):</b>	<p>Employees typically experience discomfort in the low back, and shoulders.</p> <p>The back/torso and legs/knees/feet are the body areas that most commonly receive a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	Postural Analysis, Vibration Analysis, Biomechanical Lifting Analysis, NIOSH Lifting Equation

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Controls levers are too high or too far away</li> </ul>	41. Move work piece closer to body <ul style="list-style-type: none"> <li>relocate or lower keypads or other stock tracking equipment</li> </ul>	✓		low	low	med
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Pulling control levers is difficult due to poor lever maintenance or poor lever design</li> <li>Turning steering wheel is difficult due to poor maintenance or poor design (e.g., non-powered)</li> </ul>	101. Provide appropriate controls which do not require excessive force <ul style="list-style-type: none"> <li>contact supplier to investigate adjustable and/or smoother traveling levers</li> </ul>		✓	high	low	med
		148. Provide appropriate equipment <ul style="list-style-type: none"> <li>contact supplier to investigate power steering</li> </ul>		✓	high	low	med
		35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>maintain equipment to reduce forces associated with lever action and steering</li> </ul>	✓		low to med	low	low
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
4. Head/neck bent or twisted	• Work location/path of travel located behind operator	147. Provide an alternate container • reduce the height of pallet loads when practical	✓		low	med	med
		13. Encourage ergonomic work techniques • encourage the operator to shift his/her whole body rather than just the head/neck	✓		low	low	low
		20. Incorporate rest pauses	✓		low	low	low
		25. Increase task variety	✓		low	low	low
	• Looking up at stacks for prolonged periods	84. Provide an adjustable mirror • provide mirrors for seeing high up		✓	med	low	low
	• Difficult to see around overhead guarding	148. Provide appropriate equipment • select models with improved cage visibility		✓	high	med	med
		• replace cage with reinforced clear plastic sheet		✓	med	med	med
	• Controls are too high or too far away	41. Move work piece closer to body • relocate or lower keypads or other stock tracking equipment	✓		low	low	med

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Fork truck control design requires operator to repeatedly bend the wrist back and forth.</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>maintain fork truck controls to require a minimum of wrist movement</li> </ul>	✓		low	low	med
		101. Provide appropriate controls which do not require excessive force <ul style="list-style-type: none"> <li>contact supplier to investigate adjustable levers or speed knob option to improve wrist posture</li> </ul>		✓	low to med	low	low
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Wide handle span or single finger activation on fork truck controls</li> </ul>	101. Provide appropriate controls which do not require excessive force <ul style="list-style-type: none"> <li>provide controls with multi-finger triggers and which allows the thumb and finger to be together</li> </ul>		✓	high	low	low
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Pulling control levers is difficult due to poor lever maintenance or poor lever design</li> </ul>	101. Provide appropriate controls which do not require excessive force <ul style="list-style-type: none"> <li>contact supplier to investigate adjustable and/or smoother traveling levers</li> </ul>		✓	high	low	med

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Turning steering wheel is difficult due to poor maintenance or poor design (e.g., non-powered)</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>contact vendor to investigate purchase of powered steering option</li> </ul> 35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>maintain equipment to reduce forces associated with lever action and steering</li> </ul>		✓	high	low	med
			✓		low	low	low
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Fork truck control design requires operator to repeatedly bend the wrist back and forth.</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>maintain fork truck controls to require a minimum of wrist movement</li> </ul>	✓		low	low	low
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
11. Hand/fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> </ul>	93. Provide appropriate gloves  12. Encourage appropriate seasonal clothing	✓  ✓		low  low	low  low	low  low

## **Back/Torso**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Looking at stack for bar code</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>increase size of pallet rack's bar code label</li> </ul>		✓	low to med	med	med
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Looking at stack for bar code</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>increase size of pallet rack's bar code label</li> </ul>		✓	low to med	med	med
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Viewing around load</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>reduce the height of pallet loads when practical</li> </ul>	✓		low	med	med
		84. Provide an adjustable mirrors	✓		low	low	low
	<ul style="list-style-type: none"> <li>Looking up at stacks for prolonged periods</li> </ul>	84. Provide adjustable mirrors	✓		low	low	low
		<ul style="list-style-type: none"> <li>provide mirrors for seeing high up</li> </ul>					
	<ul style="list-style-type: none"> <li>Difficult to see around overhead guarding</li> </ul>	148. Provide appropriate equipment		✓	high	med	med
		<ul style="list-style-type: none"> <li>select models with improved cage visibility</li> <li>replace cage with reinforced clear plastic sheet</li> </ul>		✓	med	med	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Difficult to see around overhead guarding</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>move entire pallet rather than moving heavy objects off the pallet. This may require relocating the stock location</li> </ul>	✓		low to high	low	med
16. Lifting forces	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> <li>Truck or standing surface may increase exposure to vibration</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>keep fork trucks in top condition and conduct vibration measurement when appropriate</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Floor/surface condition causes shock or high forces during transport</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>repair cracks or gaps in floor</li> </ul>		✓	high	low	med



## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Leaning against racks or cages may expose legs to hard edges</li> </ul>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>wrap hard edges of cages with padding</li> <li>provide knee pads when appropriate</li> </ul>	✓		low	low	low
			✓		low	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Operating foot pedals</li> <li>Lack of foot space</li> </ul>	101. Provide appropriate controls which do not require excessive force <ul style="list-style-type: none"> <li>substitute hand controls for foot controls</li> </ul>		✓	med to high	low	low
		50. Provide a foot pedal which requires the correct amount of force to use <ul style="list-style-type: none"> <li>provide heel support for foot pedal</li> <li>provide a place to rest back while operating the pedal</li> </ul>	✓	✓	low to med low to high	low med	low med
		80. Provide adequate leg clearance <ul style="list-style-type: none"> <li>contact vendor to investigate alternative vehicles with increased leg clearances</li> </ul>		✓	med to high	med	med

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Operating foot pedals</li> <li>Lack of foot space</li> </ul>	134. Replace standing foot pedals with alternative controls <ul style="list-style-type: none"> <li>substitute hand controls for foot controls</li> </ul>		✓	med to high	low	low
		145. Modify foot pedal <ul style="list-style-type: none"> <li>provide a heel support for foot pedal</li> </ul>	✓		low to med	low	low

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Hard to read stock list</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>provide task light inside truck to illuminate stock list</li> </ul>		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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## CASE STUDY – Inspect and Repair Support Equipment

### TASK TITLE: Inspect and Repair Support Equipment

<b>Task Description:</b>	<p>The Inspect and Repair Support Equipment task can involve life jackets, rafts, parachutes and oxygen masks. The task requires the person to visually inspect the work piece, remove components, repair components if required, and reassemble the components. Repair can include sewing, bolting and screwing components, as well as cutting and cleaning. Additionally, refer to the M/I Guide for case studies on Case Study 41- Sewing; Case Study 4 - Bolting/Screwing and Case Study 33 – Packing.</p> <p>Typical jobs in which Inspect and Repair Support Equipment tasks occur (but are not necessarily limited to) can include:</p> <ul style="list-style-type: none"> <li>• Oxygen masks</li> <li>• Life Rafts</li> <li>• Life Jackets</li> </ul>
<b>Job Performance Measures Most Often Impacted by Inspect and Repair Support Equipment :</b>	<p>Measures of work performance can include (not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Quality of the repairs and inspections</li> <li>• Number of pieces completed</li> </ul>
<b>Typical Employee Comments about Inspect and Repair Support Equipment:</b>	<p>Employees typically experience discomfort in the hands/wrists/arms, shoulder/neck, and head/eyes.</p> <p>The hands/wrists/arms and shoulder/neck are the body areas that most commonly receive a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	<p>Biomechanical Lifting Analysis, Push/Pull Force Analysis, Grip Force</p>

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	• Object too high	120. Raise the chair • raise the chair and provide a footrest if the feet are unsupported	✓		low	low	med
		32. Lower the work piece/work surface • lower the table or object so that the individual is positioned at or just below elbow level when assembly parts or removing parts	✓		low	low	med
		123. Raise the person • provide a platform to raise the person in relation to the object	✓		low	low	med
	• Object too far away	41. Move work piece closer to body • pull the object close to the work surface edge rather than reaching across the surface	✓		low	low	low
2. Arm forces: Repeated are forces or holding/ carrying materials	• Item is too heavy	61. Provide a mechanical lift device • provide a portable engine hoist-type crane with four point attachment		✓	high	high	high
		131. Reduce weight of work piece • reduce the weight of the object (raft) by moving individual components separately	✓		low	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low

### Shoulder/Neck (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Pulling ties on chutes</li> </ul>	55. Provide a hook-type tool to pull items					
		<ul style="list-style-type: none"> <li>provide t-handle hook tools for pulling ties</li> <li>provide stable winch device to pull ties</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Use hand to compress item</li> </ul>	148. Provide appropriate equipment					
		<ul style="list-style-type: none"> <li>use a heavy weight and lift device to compress materials</li> </ul>	✓		med to high	med	med
	<ul style="list-style-type: none"> <li>High forces required to install or remove component</li> </ul>	128. Reduce force required to install or remove the component					
		<ul style="list-style-type: none"> <li>use lubricant where feasible</li> <li>modify design of component or subsystem to reduce forces during installation or removal</li> </ul>	✓	✓	low high	low med	med med
	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	19. Improve wheel condition					
		<ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low	low	low
		119. Provide wheels	✓		low	med	med

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Cart or piece of equipment is too heavy to be pushed manually</li> </ul>	67. Provide a powered cart		✓	high	med	med
		<ul style="list-style-type: none"> <li>provide a powered cart to move large life rafts</li> <li>redesign existing life raft containers so that the containers have wheels</li> </ul>		✓	med	med	med
		151. Reduce weight of the load placed on the cart					
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	<ul style="list-style-type: none"> <li>reduce number of items or weight of items on cart</li> </ul>	✓		low	low	low
		17. Improve floor condition	✓		low	med	high
		<ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓	✓	med high	med med	med med
	<ul style="list-style-type: none"> <li>Carry distance is more than three steps</li> </ul>	126. Reduce carry distance					
		<ul style="list-style-type: none"> <li>arrange storage and work areas to reduce travel distances</li> </ul>	✓		low	low	med
		67. Provide a powered cart		✓	high	low	med
		11. Eliminate unnecessary tasks	✓		low	med	med
		<ul style="list-style-type: none"> <li>eliminate or combine handling tasks</li> <li>transport items in larger quantities instead of handling them individually</li> </ul>	✓		low	med	med




### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Carry distance is more than three steps (continued)</li> </ul>	37. Modify facilities to decrease handling <ul style="list-style-type: none"> <li>widen doors to allow materials to be handled on carts</li> </ul>		✓	high	med	med
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Item is difficult to move</li> </ul>	128. Reduce force required to install or remove the component <ul style="list-style-type: none"> <li>use lubricant when possible</li> <li>modify design of component or subsystem to reduce forces during installation or removal</li> </ul>	✓	✓	low high	med med	med med
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Objects positioned flat on work surface or too low</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>elevate the work piece by raising the table</li> </ul> 146. Angle the work surface <ul style="list-style-type: none"> <li>angle the work surface forward 15 degrees or tilt the work piece by supporting it with a slanted surface</li> </ul>	✓	✓	med  med	med  med	med  med

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Sewing with a needle causes awkward wrist positions</li> <li>Reaching for components located off to one side</li> <li>Cutting fabric or components</li> </ul>	66. Provide a power tool <ul style="list-style-type: none"> <li>use a sewing machine to perform routine sewing tasks</li> </ul>		✓	high	high	high
		20. Incorporate rest pauses	✓		low	low	low
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>place the components directly in front of the individual or next to the individual</li> </ul>	✓		low	low	low
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>use a hook type tool to pull items</li> </ul>	✓		low	low	med
		77. Provide a tool with an appropriate handle angle <ul style="list-style-type: none"> <li>provide angled scissors that bend the tool rather than the wrist</li> </ul>	✓		low	med	med

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Hand tying/pulling</li> <li>Assemble and disassemble masks</li> </ul> 	25. Increase task variety	✓		low	low	low
		<ul style="list-style-type: none"> <li>alternate between different tasks (e.g. packing chutes and sewing)</li> </ul> 20. Incorporate rest pauses	✓		low	low	low
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Cutting fabric</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a mechanized power cutting tool</li> </ul>	✓		med	med	med

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> <li>Item has no handles</li> <li>Item is bulky</li> <li>Item is slick making grasp difficult</li> <li>Sewing with a needle</li> <li>High force required to snap components into place or remove</li> <li>Pulling ties on chutes</li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide or fabricate handles on the life raft</li> </ul>	✓		low	low	low
		61. Provide a mechanical lift device		✓	high	high	med
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a small tool to help drive the sewing needle through tough material - the tool could be a solid block of wood or metal thimble that would allow the individual to use a power grip rather than a pinch grip to push the needle through the fabric.</li> </ul>	✓		low	low	low
		148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide a small presses to insert/remove components</li> </ul>		✓	med	high	low
		55. Provide a hook-type tool to pull items <ul style="list-style-type: none"> <li>provide stable winch device to pull ties</li> </ul>	✓		low	low	low

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Pulling cord</li> <li>Use hand to compress item</li> <li>Hard edges on tool handles</li> </ul>	25. Increase task variety <ul style="list-style-type: none"> <li>alternate between different tasks (e.g. packing chutes and sewing)</li> </ul>	✓		low	low	low
		55. Provide a hook-type tool to pull items <ul style="list-style-type: none"> <li>provide stable winch device to pull ties</li> </ul>	✓		low	low	low
		148. Provide appropriate equipment <ul style="list-style-type: none"> <li>use a heavy weight and a lift device to compress materials</li> </ul>	✓		med to high	med	med
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide tools with rounded compressible handles with no pressure points in the hand</li> </ul>	✓		low to med	low	low
9. Exposure to hard edges	<ul style="list-style-type: none"> <li>Edge of worksurface</li> </ul>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>cover hard edges with a compressible pad</li> <li>round off hard edges</li> </ul>	✓		low to med	low	low
			✓		low to med	low	low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Object is too low</li> <li>Packing chutes/rafts on floor</li> <li>Object is too far away</li> <li>Person tends to use the back to lift instead of using the legs to assist in the lift (Check to make sure that there is no contributing factor in the workplace)</li> </ul>	124. Raise the work piece/work surface	✓		low	low	low
		<ul style="list-style-type: none"> <li>place heaviest items between knuckle and shoulder height (25"-50") (64-127 cm)</li> </ul>					
		<ul style="list-style-type: none"> <li>provide tables to pack chutes/rafts</li> </ul>		✓	med	med	med
		<ul style="list-style-type: none"> <li>provide an adjustable table or scissor lift for work piece</li> </ul>		✓	high	med	med
		38. Move closer to the work location	✓		low	low	low
		<ul style="list-style-type: none"> <li>remove obstructions under the surface or in front of the surface</li> </ul>					
		41. Move work piece closer to body	✓		low	low	low
		61. Provide a mechanical lift device					
		<ul style="list-style-type: none"> <li>provide a spring-loaded table or materials handling device (e.g., vacu-hoist) to move the object</li> </ul>		✓	high	high	high
		13. Encourage ergonomic work techniques					
		<ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use leg muscles to lift</li> </ul>	✓		low	low	low

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Access is restricted to a component that needs to be removed</li> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	82. Provide adequate work space <ul style="list-style-type: none"> <li>improve access to items stored on shelves</li> </ul>	✓		low	med	med
		61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide mechanical assistance for handling the load</li> </ul>		✓	high	med	med
		130. Reduce the angle a person has to turn to transfer an item <ul style="list-style-type: none"> <li>for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> </ul>	✓		low	low	low
		150. Re-design work space <ul style="list-style-type: none"> <li>re-design the work space so that adjacent work areas are at 90 degrees to one another</li> </ul>		✓	high	high	high
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use legs to pivot when handling a load</li> </ul>	✓		low	low	low

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements or lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Oxygen mask component stuck in location</li> <li>High forces are required to pack item</li> <li>Person tends to lift raft with a jerky motion instead of a smooth motion</li> </ul>	128. Reduce force required to install or remove the component <ul style="list-style-type: none"> <li>use lubricant when feasible</li> <li>modify design of component or subsystem to reduce forces during installation or removal</li> </ul>	✓		low	med	med
				✓	high	med	med
		148. Provide appropriate equipment <ul style="list-style-type: none"> <li>use a heavy weight and a lift device to compress materials</li> </ul>		✓	med to high	med	med
		61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide a portable hoist or crane with four-point attachment to lift and move the raft</li> </ul>		✓	high	high	high
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth controlled motions while handling items</li> </ul>	✓		low	low	low



### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Object located too low</li> <li>Packing chutes and rafts on floor</li> </ul>	124. Raise the work piece/work surface					
		<ul style="list-style-type: none"> <li>place heaviest items between knuckle and shoulder height (25"-50") (64-127 cm)</li> </ul>	✓		low	low	med
		<ul style="list-style-type: none"> <li>provide a table to pack chutes and rafts</li> </ul>	✓		low	med	med
		<ul style="list-style-type: none"> <li>provide an adjustable table or scissor lift for work piece</li> </ul>		✓	high	med	med
		38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions</li> </ul>	✓		low	low	med
		41. Move work piece closer to body	✓		low	low	low
16. Lifting forces	<ul style="list-style-type: none"> <li>Item is too heavy</li> <li>High forces are required to pack item</li> </ul>	61. Provide a mechanical lift devuce		✓	high	med	med
		142. Use two or more persons to perform the transfer	✓		low	low	low
		128. Reduce force required to install or remove the component					
		<ul style="list-style-type: none"> <li>use a mechanical device to place pressure on the life raft when packing into the container</li> </ul>		✓	high	med	med
		<ul style="list-style-type: none"> <li>use a device to extract the remaining air in the life raft so that the raft is small and compact</li> </ul>		✓	high	low	med
		<ul style="list-style-type: none"> <li>modify design of component or subsystem to reduce forces during installation or removal</li> </ul>		✓	high	med	med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> <li>Cart or piece of equipment is too heavy to be pushed manually</li> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low	low	med
		119. Provide wheels <ul style="list-style-type: none"> <li>check bearings and tread composition to ensure ability to meet loading and movement requirements</li> </ul>	✓		low	low	med
		67. Provide a powered cart <ul style="list-style-type: none"> <li>provide motorized assistance to transport cart or piece of equipment</li> </ul>		✓	high	med	med
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low low high	low low med	med med med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Prolonged standing</li> </ul>	1. Alternate between sitting and standing tasks	✓		low	low	med
		52. Provide a footrest or footrail	✓		med	med	low
		<ul style="list-style-type: none"> <li>encourage footrest use</li> </ul>					
		86. Provide an appropriate anti-fatigue mat		✓	med	low	low
		<ul style="list-style-type: none"> <li>provide anti-fatigue matting in front of work tables where the person must stand for extended period of time</li> <li>investigate the feasibility of running anti-fatigue matting the entire length of the parachute table</li> </ul>		✓	med	low	med
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Lack of forward and vertical leg room when working in a seated position</li> </ul>	96. Provide appropriate shoe inserts	✓		low	low	med
		150. Re-design work space	✓		high	med	med low
		<ul style="list-style-type: none"> <li>provide a work bench that accommodates both adequate vertical and horizontal leg room – the table thickness should be no greater than 1.5 inches (3.8 cm) to accommodate vertical leg room</li> </ul>					
		1. Alternate between sitting and standing tasks	✓		low	low	med

### Legs/Feet (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Legs dangle from chair</li> <li>Edge of seat presses into back of legs</li> </ul>	87. Provide an appropriate chair/stool <ul style="list-style-type: none"> <li>provide a chair with the appropriate seat pan</li> </ul>		✓	high	med	med
	<ul style="list-style-type: none"> <li>Kneeling on a hard surface while packing life rafts</li> </ul>	95. Provide appropriate knee protection	✓		low	med	med
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Work object is too low</li> <li>Packing chutes/rafts on floor</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide an adjustable table for work piece</li> <li>provide tables to pack chutes/rafts</li> </ul>	✓	✓	high	med	med
		20. Incorporate rest pauses	✓		low	low	low
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Packing chutes/rafts on floor</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide an adjustable table for work piece</li> <li>provide tables to pack chutes/rafts</li> </ul>		✓	high	med	med
				✓	low	med	med

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Low light level due to location of the component</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>provide a portable task light that can be moved around the area or clamped onto a support work surface to improve light levels (Light level should be 150fc to 200fc for work)</li> </ul>		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Work on small components</li> </ul>	60. Provide a magnifying glass <ul style="list-style-type: none"> <li>provide a magnifying glass that will magnify the work piece - the magnifier should be height, angle and horizontally adjustable</li> </ul>		✓	med	med	med

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## CASE STUDY – Loading and Unloading

### TASK TITLE: Loading and Unloading

<b>Task Description:</b>	<p>The Loading and Unloading task, which can occur in a wide variety of jobs, often occurs as part of another job. For instance, meat cutters often must load boxes of meat onto carts and unload onto the cutting area. Other case studies that may provide additional information on related tasks are as follows: In the M/I Guide: Lifting – Case Study 22; in the W/S Guide Supplement Fork Truck Operation (sitting) (Case Study #8) Fork Truck Operation (standing) (Case Study #9), Packing/Shipping (Case Study #14), Picking/Stocking (Case Study #17), and Transporting Loads on Non Powered Carts (Case Study #20).</p> <p>Typical environments in which the Loading and Unloading task may be found can include:</p> <ul style="list-style-type: none"> <li>• Loading docks</li> <li>• Storage areas</li> <li>• Maintenance shops</li> <li>• Mail rooms</li> </ul>
<b>Job Performance Measures Most Often Impacted by Loading and Unloading:</b>	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Time per box</li> <li>• Rate of damaged boxes</li> </ul> <p>In most applications, there are no formal measures.</p>
<b>Typical Employee Comments about Loading and Unloading:</b>	<p>Employees typically experience discomfort in the lower or middle back.</p> <p>The back/torso is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	<p>NIOSH Lifting Equation, Biomechanical Lifting Analysis</p>

## **Shoulder/Neck**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Object is too high</li> <li>Object is too far away</li> </ul>	32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>place heaviest items below shoulder height and above knuckle height (25"-50") (64-127cm)</li> </ul>	✓		low	low	med
		38. Move closer to the work location <ul style="list-style-type: none"> <li>step closer to load</li> </ul>	✓		low	low	low
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>slide load to edge before lifting</li> </ul>	✓		low	low	low
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>use a lift cart to retrieve and deliver objects – the operator can slide objects rather than lift</li> </ul>		✓	low to med	med	med
		61. Provide a mechanical lift device		✓	med	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low
		26. Increase weight of work piece <ul style="list-style-type: none"> <li>increase work piece mass to ensure handling with a lifting device</li> </ul>		✓	low to high	low	low
		131. Reduce weight of work piece <ul style="list-style-type: none"> <li>contact vendor and inquire about receiving units in less mass</li> </ul>		✓	med	low	low



### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Item is stuck or wedged in place</li> </ul>	132. Remove obstructions <ul style="list-style-type: none"> <li>take time to remove obstacles interfering with movement rather than trying to “force” the object free</li> </ul>	✓		low	low	low
		149. Provide appropriate tool <ul style="list-style-type: none"> <li>provide a tool that would help dislodge the item, without using excessive force</li> </ul>		✓	low	low	med
	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart causes high forces</li> <li>Pulling object across shelf results in high forces</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low	low	high
		119. Provide wheels <ul style="list-style-type: none"> <li>install appropriate wheels</li> </ul>	✓		med	low	low
		46. Provide a ball-bearing rotation table <ul style="list-style-type: none"> <li>provide a ball-bearing rotation table to slide the object closer</li> </ul>		✓	med to high	low	med
		151. Reduce weight of the load placed on the cart	✓		low	low	low
	<ul style="list-style-type: none"> <li>Cart or piece of equipment is too heavy to be pushed manually</li> </ul>	67. Provide a powered cart (Note: This may require wide doors and/or ramps.)		✓	high	low	med

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> <li>Carry distance is more than three steps</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low low high	med med med	med med med
		126. Reduce carry distance <ul style="list-style-type: none"> <li>arrange storage and work areas to reduce travel distances</li> </ul>		✓	low to high	low	high
		67. Provide a powered cart (Note: This may require wide doors and/or ramps.)		✓	high	low	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>eliminate or combine handling tasks</li> </ul>	✓		low	low	high
		<ul style="list-style-type: none"> <li>transport items in larger quantities instead of handling them individually (Note: Exercise caution when increasing quantities in a load to avoid overloading the operator. Using powered assistance is the best strategy in this case)</li> </ul>		✓	med to high	low	med


### **Shoulder/Neck (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lift</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use smooth controlled motions while handling items</li> </ul>					
		61. Provide a mechanical lift device		✓	med to high	med	high
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Inadequate head room causes awkward postures</li> </ul>	82. Provide adequate workspace	✓		low	med	med
		<ul style="list-style-type: none"> <li>store item in area where there is adequate headroom</li> </ul>					
		<ul style="list-style-type: none"> <li>use flow-racks to cue items to the front of a storage rack</li> </ul>		✓	high	med	high
		55. Provide a hook-type tool to pull items		✓	med	med	high


## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Shape of grasping location (handle) on work piece causes awkward wrist positions</li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide handles which pivot slightly to permit a straight wrist during handling</li> <li>provide cut-outs on boxes or containers</li> </ul>		✓	med	low	low
				✓	med	med	med
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Handling large products</li> </ul>	147. Provide alternate container		✓	med	med	med
		<ul style="list-style-type: none"> <li>provide a smaller container</li> <li>provide a more stable container</li> </ul>		✓	med	med	med
		94. Provide appropriate handles		✓	med	med	med
		61. Provide a mechanical lift device		✓	med	med	low

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> <li>Item has no handles</li> <li>Item is slippery</li> </ul>  <ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	147. Provide an alternate container	✓	✓	med	med	med
		<ul style="list-style-type: none"> <li>provide a smaller container</li> <li>provide a more stable container</li> </ul>	✓	✓	med	med	med
		94. Provide appropriate handles		✓	med	med	med
		93. Provide appropriate gloves	✓				
		<ul style="list-style-type: none"> <li>provide gloves with a high friction surface</li> </ul>			low	low	low
		4. Change a lifting/carrying task into a rolling or sliding task					
		<ul style="list-style-type: none"> <li>use a portable lift cart to retrieve and deliver objects - the operator can slide objects rather than lift</li> </ul>		✓	low to med	med	med
		61. Provide a mechanical lift device		✓	med	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low
		131. Reduce weight of work piece	✓	✓	low to high	low	low
	<ul style="list-style-type: none"> <li>Item is stuck or wedged in place</li> </ul>	132. Remove obstructions					
		<ul style="list-style-type: none"> <li>take time to remove obstacles interfering with movement. Avoid trying to “force” the object free</li> </ul>	✓		low	low	high



### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Item is stuck or wedged in place (continued)</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a pry bar or wedge</li> </ul> 61. Provide a mechanical lift device	✓	✓	med	low	low
				✓	med to high	med	med
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Tearing open boxes</li> </ul>	149. Provide appropriate tools	✓		low	med	med
		<ul style="list-style-type: none"> <li>use a utility knife for opening boxes</li> <li>if performing highly repetitive box opening, use a knife with an angled handle</li> </ul>	✓		low	med	med
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Item has small handles</li> <li>Handles have hard edges</li> </ul> 	88. Provide appropriate handle diameter	✓		low to med	low	low
		94. Provide appropriate handles		✓	low to med	low	low
		<ul style="list-style-type: none"> <li>provide rounded slightly compressible handles</li> </ul> 61. Provide a mechanical lift device		✓	med to high	med	med

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
11. Hands and fingers exposed to cold temperatures	• Work area is too cold	12. Encourage appropriate seasonal clothing	✓		low to med	med	med
		93. Provide appropriate gloves	✓		low to med	med	low

## Back/Torso


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Object is too low</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>place heaviest items between knuckle and shoulder height and on middle shelves of storage racks</li> <li>provide a fixed table to support work piece</li> <li>provide an adjustable table</li> </ul>	✓		low	med	med
				✓	med	med	med
				✓	med to high	med	med
	<ul style="list-style-type: none"> <li>Object is too far away</li> </ul> 	38. Move closer to the work location <ul style="list-style-type: none"> <li>step closer to load</li> </ul>	✓		low	med	low
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>slide load to edge before lifting</li> </ul>	✓		low	med	low
		46. Provide a ball-bearing rotation table <ul style="list-style-type: none"> <li>provide a ball-bearing transfer table to slide the object closer</li> </ul>		✓	med to high	low	med




### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Lifting item out of a deep container causes awkward bending</li> <li>Person tends to use the back to lift instead of using the legs to assist in the lift (check to make sure that there is no contributing factor in the workplace)</li> <li>Work area layout</li> </ul>	147. Provide alternate container <ul style="list-style-type: none"> <li>use a smaller container</li> <li>use a container with drop down sides</li> <li>use a pallet instead of a bin</li> </ul>		✓	high	med	med
				✓	high	med	med
				✓	med	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use leg muscles to lift</li> </ul>	✓		low	low	low
			✓		low	low	low
		130. Reduce the angle a person has to turn to transfer the item <ul style="list-style-type: none"> <li>for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> <li>reposition supplies/materials to reduce twisting</li> </ul>	✓	✓	low to high	low	med
			✓		low	low	med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul> 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use legs to pivot when handling a load</li> </ul> 130.Reduce the angle a person has to turn to transfer an item <ul style="list-style-type: none"> <li>place adjacent pallets at 90° to one another</li> </ul>	✓  ✓	✓	low low med	low low low	low low med
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Item is bulky, awkward and/or shifts easily</li> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	61. Provide a mechanical lift device  13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth controlled movements while handling items</li> </ul>	✓	✓	med to high  low	med  low	med  low

## **Back/Torso (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Sorting from a low location</li> </ul>	124. Raise the work piece/ work surface	✓		low	med	med
		<ul style="list-style-type: none"> <li>place heaviest items between knuckle and shoulder height and on middle shelves of storage racks</li> </ul>		✓	med	med	med
		<ul style="list-style-type: none"> <li>provide a fixed table to support work piece</li> <li>provide an adjustable table</li> </ul>		✓	med to high	med	med
16. Lifting forces	<ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	61. Provide a mechanical lift device		✓	med to high	med	med
		142. Use two or more persons to perform the transfer	✓				
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	19. Improve wheel condition		✓	med	med	med
		<ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>					
		119. Provide wheels		✓	med	med	med
		<ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul>		✓	med	med	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Cart or piece of equipment is too heavy to be pushed manually</li> </ul>	151. Reduce the weight of the load placed on the cart <ul style="list-style-type: none"> <li>reduce number of items or weight of items on cart</li> </ul>	✓		low	med	low
		67. Provide a powered cart <ul style="list-style-type: none"> <li>provide motorized assistance to transport cart or piece of equipment</li> </ul>		✓	med to high	med	med
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓		low high med	med med low	med med low
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Standing on hard surface</li> <li>Leaning against bin during loading</li> </ul>	86. Provide an appropriate anti-fatigue mat	✓		low to med	low	med
		96. Provide appropriate shoe inserts	✓		low	low	low
		147. Provide an alternate container <ul style="list-style-type: none"> <li>use a smaller container</li> <li>use a container with drop down sides</li> </ul>		✓ ✓	med low	low low	med low
		95. Provide appropriate knee protection	✓		low	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Work object is too low, causing the foot to bend at the toes for balance</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide support for the work piece</li> <li>provide an adjustable table for work piece</li> </ul>	✓	✓	low to med med to high	med med	med med
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Work object is too low, causing the foot to bend at the toes for balance</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide support for the work piece</li> <li>provide an adjustable table for work piece</li> </ul>	✓	✓	low to med med to high	med med	med med
		132. Remove obstructions <ul style="list-style-type: none"> <li>clear boxes and other items off the floor</li> </ul>	✓		low	med	med

## Head/Eyes


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>light levels should be 50fc to 75fc for work</li> </ul>		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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<b>CASE STUDY – Lubricating</b>	
<b>TASK TITLE: Lubricating</b>	
<b>Task Description:</b>	<p>The Lubricating task is typically one step in routine vehicle maintenance. Lubricating is typically a moderate duration task. Lubricating may be performed on vehicles, (cars, trucks, trailers, etc.) or equipment (sliding doors, carts, etc.).</p> <p>Typical environments in which the Lubricating task may be found can include:</p> <ul style="list-style-type: none"> <li>• Vehicle Maintenance and Repair</li> <li>• Equipment/Shop Maintenance</li> </ul>
<b>Job Performance Measures Most Often Impacted by Lubricating:</b>	<p>Measure of work performance can include (but is not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Time to complete task</li> </ul>
<b>Typical Employee Comments about Lubricating:</b>	<p>Employees typically experience discomfort in the shoulders.</p> <p>The shoulder/neck is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	Postural Analysis, Dynamic Task Analysis




## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use long flexible lube gun attachments to promote reaching with the nozzle rather than the whole gun</li> <li>use a pneumatic driven lube gun to reduce time in awkward positions</li> </ul>		✓	low	low	med
				✓	med	low	high
					low	low	low
				✓	high	med	high
				✓	low to med	med	med
		38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions to lubrication point</li> <li>use a vehicle lift or pit to improve access to lubrication points</li> <li>use a crawler to improve position</li> </ul>	✓				

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
3. High speed sudden shoulder movements	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points</li> </ul> 	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use pneumatic driven lube gun to reduce time in awkward positions</li> <li>use crawlers with adjustable angle head and back supports</li> </ul>		✓	med	low	high
				✓	med	med	med
		38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions to lubrication point, such as wheels and tires</li> <li>use a vehicle lift or pit to improve access to lubrication points</li> </ul>	✓		low	low	low
				✓	high	med	high
		22. Increase light levels <ul style="list-style-type: none"> <li>use adjustable position task lighting to improve visual access</li> </ul>	✓		low to med	med	low

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/ repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points</li> </ul> 	149. Provide appropriate tools		✓	med	low	low
		<ul style="list-style-type: none"> <li>use long flexible lube gun attachments to promote reaching with the nozzle rather than the whole gun, and to promote bending the flexible attachment rather than the wrist</li> <li>use pneumatic driven lube gun to reduce time in awkward positions</li> </ul>		✓	med	low	low
		38. Move close to the work location	✓		low	low	low
		<ul style="list-style-type: none"> <li>remove obstructions to lubrication point, such as wheels and tires</li> <li>use a vehicle lift or pit to improve access to lubrication points</li> <li>use a crawler to improve position</li> </ul>		✓	high	med	high
				✓	low to med	med	med

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Design of gun</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a gun with multi-finger trigger which does not require hyperextension</li> </ul>		✓	med	low	low
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Repeatedly squeezing lubrication gun</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use pneumatic driven lube gun</li> </ul>		✓	med	low	high
9. High speed hand/wrist /arm movement or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Resting the arm against hard edges while reaching to awkward lubrication points</li> </ul>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>use high density foam padding for any areas with prolonged contact</li> </ul>	✓		low	low	low
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>use pneumatic driven lube gun to reduce time in awkward positions</li> </ul>		✓	med	low	high
		38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstruction to point</li> <li>use a vehicle lift or pit to improve access to lubrication points</li> </ul>	✓	✓	low high	low med	low high
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> </ul>	12. Encourage appropriate seasonal clothing	✓		low	low	low
		93. Provide appropriate gloves	✓		low	low	low
		23. Increase room temperature		✓	high	low	low

## **Back/Torso**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points</li> </ul>	149. Provide appropriate tools		✓	low	low	med
		<ul style="list-style-type: none"> <li>use long flexible lube gun attachments to promote reaching with the nozzle rather than the whole gun</li> </ul>		✓	med	med	med
		<ul style="list-style-type: none"> <li>use crawlers with adjustable angle head, back and thigh support</li> </ul>		✓	med	low	high
		38. Move closer to the work location	✓		low	low	low
		<ul style="list-style-type: none"> <li>remove obstructions to lubrication point</li> <li>use a vehicle lift or pit to improve access to lubrication points</li> </ul>		✓	high	med	high
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points</li> </ul>	149. Provide appropriate tools		✓	low	low	med
		<ul style="list-style-type: none"> <li>use long flexible lube gun attachments to promote reaching with the nozzle rather than the whole gun</li> </ul>		✓	med	med	med
		<ul style="list-style-type: none"> <li>use crawlers with adjustable angle head, back and thigh support</li> <li>use pneumatic driven lube gun to reduce time in awkward positions</li> </ul>		✓	med	low	high

### Back/Torso (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points (continued)</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions to lubrication point</li> <li>use a vehicle lift or pit to improve access to lubrication points</li> </ul>	✓	✓	low high	low med	low high
14. High speed sudden movements or lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>use long flexible lube gun attachments to promote reaching with the nozzle rather than the whole gun</li> <li>use crawlers with adjustable angle head, back and thigh support</li> <li>use pneumatic driven lube gun to reduce time in awkward positions</li> </ul> 38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions to lubrication point, such as wheels and tires</li> <li>use a vehicle lift or pit to improve access to lubrication points</li> </ul>	✓	✓  ✓ ✓  ✓	low  med med  low high	low  med low  low med	med  med high  low high

### **Back/Torso (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Lifting forces	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					



## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position standing	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points</li> </ul> 	<p>9. Eliminate exposure to hard edges</p> <ul style="list-style-type: none"> <li>use high density foam padding for any areas with prolonged contact</li> </ul> <p>149. Provide appropriate tools</p> <ul style="list-style-type: none"> <li>use pneumatic driven lube gun to reduce time in awkward positions</li> </ul> <p>38. Move closer to the work location</p> <ul style="list-style-type: none"> <li>remove obstructions to lubrication point</li> <li>use a vehicle lift or pit to improve access to lubrication points</li> </ul> <p>95. Provide appropriate knee protection</p>	✓		low	low	low
				✓	med	low	high
			✓		low	low	low
				✓	high	med	high
				✓	low	low	low

### Legs/Feet (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points</li> </ul>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>use high density foam padding for any areas with prolonged contract</li> </ul>	✓		low	low	low
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>use pneumatic driven lube gun to reduce time in awkward positions</li> </ul>		✓	med	low	high
		38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions to lubrication point</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>use a vehicle lift or pit to improve access to lubrication points</li> </ul>		✓	high	med	high
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Accessing awkward lubrication points</li> </ul>	38. Move closer to the work location	✓				
		<ul style="list-style-type: none"> <li>remove obstructions to lubrication point</li> <li>use a vehicle lift or pit to improve access to lubrication points</li> </ul>		✓	low high	low med	low high
		18. Improve visual access to work		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					


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## CASE STUDY – Molding

### TASK TITLE: Molding

<b>Task Description:</b>	<p>The Molding task’s purpose is to construct a mold. Mold construction requires completion of different assembly and finishing tasks including: building, grinding, cutting and sanding. Further guidance for each assembly and finishing task can be found in the Maintenance and Inspection (M/I) Guide: Case Study 19 - Grinding, Case Study 4 - Cutting, and Case Study 39 - Sanding.</p> <p>Typical environments in which the molding task may be found can include:</p> <ul style="list-style-type: none"> <li>• Plastic Molding</li> <li>• Fabricating Parts</li> <li>• Repairing Parts</li> </ul>
<b>Job Performance Measures Most Often Impacted by Molding :</b>	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Quality of the repairs and inspections</li> <li>• Number of pieces completed</li> </ul>
<b>Typical Employee Comments about Molding:</b>	<p>Employees typically experience discomfort in the hands/wrists/arms, shoulder/neck, and head/eyes.</p> <p>The hands/wrists/arms and shoulder/neck are the body areas that most commonly receive a “High” priority rating. The remaining body areas are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	Biomechanical Lifting Analysis, Push/Pull Force Analysis, Dynamic Task Analysis

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Object too high</li> </ul>  <ul style="list-style-type: none"> <li>Object too far away</li> </ul>	32. Lower the work piece/work surface	✓		low	low	med
		• lower the table or object so that the individual is positioned at or just below elbow level when assembling parts or removing parts					
		123. Raise the person	✓		low to med	low to med	med
		• provide a platform to raise the person in relation to the object	✓		low to med	low	med
		• raise the chair and provide a footrest if the feet are unsupported					
		41. Move work piece closer to body	✓		low	low	low
		• pull the object close to the work surface edge rather than reaching across the surface					
		• arrange items on work surface by frequency of use	✓		low	low	low

### Shoulder/Neck (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Item is too heavy</li> <li>High forces required to pull down top of molding press or remove plastic from molding machine</li> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	61. Provide a mechanical lift device		✓	high	high	high
		131. Reduce weight of work piece <ul style="list-style-type: none"> <li>reduce the weight of the object by moving individual components separately</li> </ul>	✓		low	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low
		128. Reduce force required to install or remove the component <ul style="list-style-type: none"> <li>use lubricant where feasible</li> <li>modify design of component mold or subsystem to reduce forces during installation or removal</li> <li>investigate a work procedure to reduce plastic overruns</li> </ul>	✓	✓	low high	low med	med med
		19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low	low	low
		119. Provide wheels <ul style="list-style-type: none"> <li>install appropriate wheels</li> </ul>	✓		med	med	med

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> <li>Carry distance is more than three steps</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low med high	med med med	high med med
		126. Reduce carry distance <ul style="list-style-type: none"> <li>arrange storage and work areas to reduce travel distances</li> </ul>	✓		low	low	med
		67. Provide a powered cart <ul style="list-style-type: none"> <li>provide a cart to transport materials</li> </ul>		✓	med to high	low	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>eliminate or combine handling tasks</li> <li>transport items in larger quantities instead of handling them individually</li> </ul>	✓ ✓		low low	med med	med med
		37. Modify facilities to decrease handling <ul style="list-style-type: none"> <li>widen doors to allow materials to be handled on carts</li> </ul>		✓	high	med	med




### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lift</li> <li>Item or plastic is stuck in molding machine</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to avoid rushing while handling items</li> </ul>	✓		low	low	low
		128. Reduce force required to install or remove the component <ul style="list-style-type: none"> <li>use lubricant where feasible</li> <li>modify design of component mold or subsystem to reduce forces during installation or removal</li> </ul>	✓	✓	low high	med med	med med
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Objects positioned flat on work surface or too low</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>elevate the work piece by raising the table or angling the work piece forward.</li> </ul>	✓		med	med	med


## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Building small plastic molds</li> <li>Reaching for components located off to one side</li> <li>Object too high</li> </ul>	20. Incorporate rest pauses		✓	high	high	high
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>place the components directly in front of the individual or next to the individual</li> </ul>	✓		low	low	low
		55. Provide a hook type tool to pull items	✓		low	low	low
		32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>lower the table or object so that the table is positioned at or just above elbow level when assembling parts or removing parts</li> </ul>	✓		low	low	low
		123. Raise the person <ul style="list-style-type: none"> <li>provide a platform to raise the person in relation to the object</li> <li>raise the chair and provide a footrest if the feet are unsupported</li> </ul>	✓	✓	low to med	low to med	med
		152. Relocate the work <ul style="list-style-type: none"> <li>reorient the work to make access easier</li> </ul>	✓		low	low	low


### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Trimming</li> </ul> 	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>modify mold to minimize trimming and sanding</li> </ul>		✓	med to high	high	high
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Using cutters with a wide handle span</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide cutters with a desirable handle span which is usually less than 3"(7.6cm)</li> </ul>	✓		med	high	med


## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> <li>Item has no handles</li> <li>Item is slippery</li> </ul> 	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide appropriate tools with features (e.g., handle contour and diameter, grip material) designed to reduce grip forces</li> </ul>		✓	high	high	med
	<ul style="list-style-type: none"> <li>High force trimming or sanding</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>modify mold to minimize trimming and sanding</li> </ul>		✓	med to high	high	high

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>High force trimming or sanding</li> </ul> 	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>modify mold to minimize trimming and sanding</li> </ul>		✓	med to high	high	high
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide high quality cutting and trimming tools (including clippers and knives) which minimize forces</li> </ul>		✓	low to med	low	low
		35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>replace blades often</li> </ul>	✓		low	low	low
		66. Provide a power tool <ul style="list-style-type: none"> <li>provide powered cutting tools for high force tasks</li> <li>use leverage/mechanical advantage (e.g. mechanical presses) to reduce cutting forces</li> </ul>	✓	✓	med med	low low	low high

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Lifting dipping racks with small narrow handles</li> </ul> 	88. Provide an appropriate handle diameter <ul style="list-style-type: none"> <li>provide a wrap around the handle so that the diameter is no less than 1-1.5" (2.5-3.8cm)</li> </ul>	✓		low	med	med
	<ul style="list-style-type: none"> <li>Hard edges on tools</li> </ul>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>provide tools with rounded handles</li> <li>wrap or cover hard edges</li> </ul>	✓		med	low	low
			✓		low	low	low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Object is too low</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>place heaviest items between knuckle and shoulder height (25"-50") (64-127 cm)</li> <li>provide a fixed table to support work piece</li> <li>provide an adjustable table or scissor lift for work piece</li> </ul>	✓		low	low	low
				✓	med	med	med
				✓	high	med	med
	<ul style="list-style-type: none"> <li>Object is too far away</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions</li> <li>modify style of sliding guard to promote increased access</li> </ul>	✓		low	low	low
			✓		high	low	med
		41. Move work piece closer to body	✓		low	low	low
	<ul style="list-style-type: none"> <li>Person tends to use the back to lift instead of using the legs to assist in the lift. Check to make sure that there is no contributing factor in the workplace</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use leg muscles to lift</li> </ul>	✓		low	low	low
			✓		low	low	low




### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Access is restricted to a component that needs to be removed</li> <li>Work area layout</li> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	82. Provide adequate work space <ul style="list-style-type: none"> <li>improve access to items stored on shelves</li> </ul>	✓		low	med	med
		61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide mechanical assistance for handling the load</li> </ul>		✓	high	med	med
		130. Reduce the angle a person has to turn to transfer the item <ul style="list-style-type: none"> <li>for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> </ul>	✓		low	low	low
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use legs to pivot when handling a load</li> </ul>	✓		low	low	low



## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth controlled movements while handling items</li> </ul>	✓		low	low	low
		147. Provide an alternate container <ul style="list-style-type: none"> <li>contact vendor and request re-packing object in container with handles or increasing object density</li> </ul>		✓	med	low	low
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Object located too low</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>place heaviest items between knuckle and shoulder height (25"-50") (64-127 cm)</li> </ul>	✓		low	low	med
		<ul style="list-style-type: none"> <li>provide a fixed table to support work piece</li> </ul>	✓		low	med	med
		<ul style="list-style-type: none"> <li>provide an adjustable table or scissors lift for work piece</li> </ul>		✓	high	med	med
		38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions</li> </ul>	✓		low	low	med
		41. Move work piece closer to body	✓		low	low	low

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Poor lower back support</li> </ul>	52. Provide a footrail or footrest <ul style="list-style-type: none"> <li>encourage the person to sit back in chair</li> </ul>	✓		low to med	low	low
		87. Provide an appropriate chair/stool <ul style="list-style-type: none"> <li>provide a chair which supports lower back</li> </ul>		✓	med to high	low	low
		115. Provide support for lower back <ul style="list-style-type: none"> <li>adjust back rest</li> <li>provide a lumbar support pillow</li> </ul>	✓ ✓		low low	low low	low low
16. Lifting forces	<ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	61. Provide a mechanical lift device		✓	high	med	med
		142. Use two or more persons to perform the transfer	✓		low	low	low
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low	low	med
		119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul>	✓		low	low	med

### **Back/Torso (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low low high	low low med	med med med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

### Legs/Feet

[illegible]

### Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Lack of foot space</li> </ul>	132. Remove obstructions	✓		low	low	low
		80. Provide adequate leg clearance	✓		low to high	low	low

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Low light level due to location of the component</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>light levels should be 75fc to 100fc for work</li> <li>provide a portable task light that can be moved around the area or clamped onto a support work surface to improve light levels</li> </ul>		✓	med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Work on small components</li> </ul>	60. Provide a magnifying glass <ul style="list-style-type: none"> <li>provide a magnifying glass that will magnify the work piece - the magnifier should be height, angle and horizontally adjustable</li> </ul>		✓	med	med	med

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<b>CASE STUDY - Packing/Shipping</b>	
<b>TASK TITLE: Packing/Shipping</b>	
<b>Task Description:</b>	<p>The Packing/Shipping task typically involves filling the box with packing materials, taping the box closed, weighing the box, labeling the box and placing the box aside for shipment. The box may be placed in a bin, cart, pallet or conveyor while awaiting shipment. This case study does not address the packing of parachutes or rafts; for information on these topics please refer to the M/I Guide Case Study 33 - Packing.</p> <p>The case study also does not address loading or transporting loads. For information on these related topics, please refer to this W/I Guide Supplement for the following: Loading/Unloading- Case Study 11; Transporting Loads On Non-Powered Carts – Case Study 20; Lifting – Case Study 22.</p> <p>Typical environments in which the Packing/Shipping task may be found can include:</p> <ul style="list-style-type: none"> <li>• Warehouse</li> </ul>
<b>Job Performance Measures Most Often Impacted by Packing/Shipping:</b>	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• Number of packages shipped per day</li> <li>• Time to process requests</li> </ul>
<b>Typical Employee Comments about Packing/Shipping:</b>	<p>Employees typically experience discomfort in the lower back and shoulders.</p> <p>The back/torso and shoulders/neck are the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	NIOSH Lifting Equation, Biomechanical Lifting Analysis, Push/Pull Force Analysis




## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	• Object is too high	32. Lower the work piece/work surface • place heaviest items below shoulder height (50")(127 cm) or less and above knuckle height (25")(64 cm)	✓		low	low	med
	• Object is too far away	38. Move closer to the work location • step closer to load	✓		low	low	low
		41. Move work piece closer to body • slide load to edge before lifting	✓		low	low	low
	• Box is too big	147. Provide alternate container • provide a smaller container (reduce depth, reduce width)		✓	low to high	high	high
		• replace single big container with 2 or 4 smaller containers		✓	low to high	high	high
		• provide a cut-out flap to increase access to box		✓	low to high	high	high
		• provide a box with open or removable sides		✓	low to high	high	high

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	• Box is at a poor angle	146. Angle the work surface <ul style="list-style-type: none"> <li>• provide an angled fixture for packing</li> <li>• provide a lift and tilt table for packing</li> </ul>	✓		low	med	med
			✓		med to high	med	med
	• Lifting over flaps of packing box	149. Provide appropriate tools <ul style="list-style-type: none"> <li>• provide clips to hold flaps out of the way</li> </ul>	✓		low to med	med	med
2. Arm forces: Repeated arm forces or holding/ carrying materials	• Applying tape	153. Use desk-based tape dispenser instead of handheld dispensers		✓	low	low	low
	• Operating strapper	149. Provide appropriate tools <ul style="list-style-type: none"> <li>• provide strapper with a better gearing ratio which requires less force</li> </ul>		✓	med	low	med
		35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>• maintain strappers to reduce forces</li> </ul>	✓		low	low	low

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lift</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling items</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Applying tape</li> </ul> 	153. Use desk-based tape dispenser instead of handheld dispensers		✓	low	low	low
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Scale readout too far away</li> </ul>	39. Move monitor/screen closer to body	✓		low	high	low
		45. Position the monitor/screen in front of the body	✓		low	high	low
	<ul style="list-style-type: none"> <li>Carton/work is too low</li> </ul>	124. Raise the work piece/work surface		✓	low to med	med	med
		<ul style="list-style-type: none"> <li>provide an adjustable height surface</li> <li>provide a riser/fixture for carton to raise up to elbow height</li> </ul>	✓		low	med	med


## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	• Carton/work is too low	124. Raise the work piece/work surface		✓	low to med	med	med
		<ul style="list-style-type: none"> <li>• provide an adjustable height surface</li> <li>• provide a riser/fixture for carton to raise up to elbow height</li> </ul>	✓		low	med	med
	• Box is at a poor angle	146.Angle the work surface	✓		low	med	med
		<ul style="list-style-type: none"> <li>• provide an angled fixture for packing</li> <li>• provide a lift and tilt table for packing</li> </ul>		✓	med to high	med	med
	• Lifting over flaps of packing box	149.Provide appropriate tools	✓		low to med	med	med
	• Shape of grasping location (handle) on work piece causes awkward wrist positions	94. Provide appropriate handles		✓	med	low	low
		<ul style="list-style-type: none"> <li>• provide handles which pivot slightly to permit a straight wrist during handling</li> <li>• provide cut-outs on boxes or containers</li> </ul>		✓	low to high	high	high


### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Work method: flip folding boxes causes high speed wrist movements</li> <li>Applying tape</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>fold the box open rather than flipping it open</li> </ul> 153. Use desk-based tape dispenser instead of handheld dispensers	✓	✓	low  low	low  low	low  low
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Handling awkwardly shaped items</li> <li>Operating strapper with one hand</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>provide a smaller container</li> <li>provide a more stable container</li> </ul> 94. Provide appropriate handles 61. Provide a mechanical lift device 148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide a strapper that allows two-handed use</li> </ul>		✓ ✓  ✓ ✓  ✓	low to med low to med med med low to med	med med med med low	med med med low low
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> <li>Item is slippery</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>provide a smaller container</li> <li>provide a more stable container</li> </ul>		✓ ✓	low to med med	med med	med med

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Applying tape</li> </ul> 	153. Use desk-based tape dispenser instead of handheld dispensers		✓	low	low	low
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Item has small handles</li> <li>Handles have hard edges</li> </ul>	88. Provide an appropriate handle diameter  94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide rounded slightly compressible handles</li> </ul> 61. Provide a mechanical lift device	✓	✓  ✓	low to med  low to med  med to high	low  low  med	low  low  med
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> </ul>	12. Encourage appropriate seasonal clothing  93. Provide appropriate gloves	✓  ✓		low to med  low to med	med  med	med  low

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Object is too low</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>place heaviest items between mid thigh and shoulder height</li> <li>provide a fixed table to support work piece</li> <li>provide an adjustable table</li> </ul>	✓		low	med	med
				✓	med	med	med
				✓	med to high	med	med
	<ul style="list-style-type: none"> <li>Object is too far away</li> </ul>	41. Move closer to the work location <ul style="list-style-type: none"> <li>step closer to load</li> <li>slide load to edge before lifting</li> </ul>	✓ ✓		low low	med med	low low
		46. Provide a ball-bearing rotation table		✓	med to high	low	med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Lifting item out of a deep container causes awkward bending</li> <li>Person tends to use the back to lift instead of using the legs to assist in the lift (check to make sure that there is no contributing factor in the workplace)</li> <li>Same object is lifted repeatedly throughout the shipping process</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>use a smaller container</li> <li>use a container with drop down sides</li> <li>use a pallet instead of a bin</li> </ul>		✓	med to high	med	med
				✓	med to high	med	med
				✓	med to high	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use leg muscles to lift</li> </ul>	✓		low	low	low
			✓		low	low	low
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>install a scale in the work surface or conveyor</li> <li>use conveyors to move boxes</li> </ul>		✓	med to high	med	high
				✓	med to high	med	high
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Work area layout</li> </ul>	130. Reduce the angle a person has to turn to transfer the item <ul style="list-style-type: none"> <li>for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> <li>reposition supplies/materials to reduce twisting</li> </ul>	✓		low to high	low	med
			✓		high to low	low	med



## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	150. Redesign the workspace <ul style="list-style-type: none"> <li>place containers and surfaces so twisting is avoided</li> </ul> 13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use legs to pivot when handling a load</li> </ul>	✓		low	low	low
			✓		low	low	low
			✓		low	low	low
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Item is bulky, awkward and/or shifts easily</li> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	61. Provide a mechanical lift device  13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling items</li> </ul>	✓	✓	med to high	med	med
			✓		low	low	low
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Packing location is too low (table height too low or filling box which is on the floor)</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>raise the table to allow packing between waist and elbow height</li> <li>provide a packing table</li> <li>use an adjustable height packing table</li> </ul>		✓	med	med	med
				✓	med	med	med
				✓	med	med	med
16. Lifting forces	<ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	61. Provide a mechanical lift device  142. Use two or more persons to perform the transfer	✓	✓	med	med	low
			✓		low	low	low

### **Back/Torso (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Pushing a box on the floor to a cart, pallet or holding area</li> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>Bring a cart to the box to load at the packing point</li> </ul>	✓		low	low	med
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> </ul>	✓ ✓		low low	med med	med med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Standing in one position</li> </ul>	25. Increase task variety	✓		low	med	low
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Leaning against bin during loading</li> <li>Standing on hard surface</li> </ul>	9. Eliminate exposure to hard edges	✓		med	low	low
		147. Provide an alternate container	✓		low to med	low	med
		<ul style="list-style-type: none"> <li>use a smaller container</li> <li>use a container with drop down sides</li> <li>use a pallet instead of a bin</li> </ul>	✓	✓	med to high	low	low
		96. Provide appropriate shoe inserts	✓		low med	low	low
		86. Provide an appropriate anti-fatigue mat		✓	med	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Work object is too low</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide support for the work piece</li> <li>provide an adjustable table for work piece</li> </ul>	✓	✓	low to med med to high	med med	med med
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>Light level should be 50fc to 75fc for the work</li> </ul>		✓	low to high	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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## CASE STUDY – Palletizing

### TASK TITLE: Palletizing

<b>Task Description:</b>	<p>The Palletizing task occurs primarily in the warehouse environment and is typically performed to prepare a load for delivery to a specified location. The task usually involves consolidation, that is, taking individual items from carts or various pallet stacks and placing them on a centralized pallet according to the specifications of the requesting location. After the items are placed on the centralized pallet, the pallet is secured (by shrink-wrap, straps or other means) and delivered by fork truck to the desired location. Items that are too heavy to move manually are loaded onto the pallet by fork truck (Note: Refer to Fork Truck Operating (sitting) Case Study 8, for additional information since the use of fork trucks will not be discussed here.)</p> <p>Typical examples in which the Palletizing tasks can occur include (but are not limited to) are:</p> <ul style="list-style-type: none"><li>• Load consolidation</li><li>• Pallet build-up/tie-down</li><li>• Packing mail into tri-wall containers.</li></ul>
<b>Job Performance Measures Most Often Impacted by Palletizing:</b>	<p>Measures of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Load stability/material integrity</li><li>• Number of loads assembled/distributed per day</li></ul>
<b>Typical Employee Comments about Palletizing:</b>	<p>Employees experience discomfort in the back/torso, shoulders, and wrists.</p> <p>The back/torso and shoulder are the body areas that most commonly receive a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	<p>Dynamic task Analysis, Grip Force Measurement (for jobs using tie-down straps), Biomechanical Lifting Analysis, NIOSH Lifting Equation</p>

## **Shoulder/Neck**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Material is too low</li> <li>Material is too far from the edge of the pallet</li> </ul>	124. Raise the work piece/work surface					
		<ul style="list-style-type: none"> <li>place empty pallets under the active pallet to increase the height during loading/unloading</li> <li>provide a lift table to elevate the active pallet</li> </ul>	✓		low	low	low
				✓	high	low	med
		38. Move closer to the work location	✓		low	low	med
		<ul style="list-style-type: none"> <li>provide unobstructed access to at least three, preferably four sides of the pallet</li> </ul>					
		13. Encourage ergonomic work technique	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to walk around pallet</li> </ul>					
		41. Move work piece closer to body					
		<ul style="list-style-type: none"> <li>provide a turntable for the pallet</li> </ul>		✓	med	low	med
		127. Reduce depth of storage container					
		<ul style="list-style-type: none"> <li>provide tri-wall containers with removable sides to allow better access</li> <li>provide containers with drop down flaps</li> </ul>		✓	med	low	med
				✓	med	low	med

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Material is too high during placement of tie-down nets</li> </ul>	83. Provide an adjustable height lift table <ul style="list-style-type: none"> <li>use pits to lower the pallet during positioning of the netting over the load</li> </ul>		✓	high	low	high
		62. Provide a mechanical lift device <ul style="list-style-type: none"> <li>use a fork truck and rack to position netting over large loads</li> </ul>		✓	med	low	high
	<ul style="list-style-type: none"> <li>Shrink wrapping</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a height adjustable table for shrink wrapping</li> </ul>		✓	med	low	med
2. Arm forces: Repeated arm forces or holding/ Carrying materials	<ul style="list-style-type: none"> <li>Transferring heavy loads</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>use a fork truck to lift and place heavy items</li> <li>provide a hoist or other lifting device to lift and place heavy loads</li> </ul>	✓	✓	low	low	med
				✓	med to high	low	med
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide strapper with a better gearing ratio which requires less force</li> </ul>		✓	med	low	med
	<ul style="list-style-type: none"> <li>Operating strapper</li> </ul>	34. Maintain hand tool/power tools <ul style="list-style-type: none"> <li>maintain strappers to reduce forces</li> </ul>	✓		low	low	low



### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Obtaining tangled tie-downs from containers can require repeated forceful exertions</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>after use in the field, fold tie downs in a pattern which minimizes tangling</li> <li>provide a rack for hanging tie-downs after use to eliminate tangling</li> </ul> 11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>eliminate the use of tie-down netting; use shrink wrap</li> </ul>	✓	✓  ✓  ✓	low  med  high	low  low  low	med  med  high
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Tightening tie-downs can require excessive force and jerking motions</li> <li>Obtaining tangled tie-downs from containers can require repeated forceful exertions</li> </ul>	147. Provide appropriate tools <ul style="list-style-type: none"> <li>provide tie-downs that are equipped with a ratcheting mechanism – eliminate excessive pulling force for tightening</li> </ul> 148. Provide an alternate container <ul style="list-style-type: none"> <li>after use in the field, fold tie downs in a pattern which minimizes tangling</li> <li>provide a rack for hanging tie-downs after use to eliminate tangling</li> </ul> 11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>eliminate the use of tie-down netting; use shrink wrap</li> </ul>	✓	✓  ✓  ✓	med  low  med  high	med  low  low  low	high  med  med  high

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements (cont'd)	<ul style="list-style-type: none"> <li>Operating strapper</li> <li>Material is too high during placement of tie-down nets</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide strapper with a better gearing ratio which requires less force</li> </ul>		✓	med	low	med
		34. Maintain hand tool/power tools <ul style="list-style-type: none"> <li>maintain strappers to reduce forces</li> </ul>	✓		low	low	low
		32. Lower the work piece/work surface <ul style="list-style-type: none"> <li>use pits to lower the pallet during positioning of the netting over the load</li> </ul>		✓	high	low	high
		61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>use a fork truck and rack to position netting over large loads</li> </ul>		✓	med	low	high
		13. Encourage ergonomic work techniques	✓		low	low	low
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Inadequate headroom</li> </ul>	82. Provide adequate workspace <ul style="list-style-type: none"> <li>move palletizing area to where there is adequate head clearance</li> </ul>	✓	✓	low to high	low	med

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Repeated handling of multiple items/boxes</li> <li>One handed manual shrink wrapper</li> </ul>	11. Eliminate unnecessary tasks	✓		low	low	med
		<ul style="list-style-type: none"> <li>investigate possibility of providing full pallet load of certain items and handling with a fork truck</li> <li>whenever possible, load pallet in the opposite order of delivery needs (i.e., first item on is last item off) to avoid re-handling</li> </ul>	✓		low	low	low
		149. Provide appropriate tools		✓	med	low	med
		<ul style="list-style-type: none"> <li>provide two-handed manual shrink wrapper</li> <li>provide an automatic shrink wrapper</li> </ul>		✓	high	med	high
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Awkward containers</li> </ul>	147. Provide an alternative container	✓	✓	med	med	med
		<ul style="list-style-type: none"> <li>provide a smaller container</li> <li>provide a more stable container</li> </ul>			med	med	med
		94. Provide appropriate handles		✓	med	med	med
		61. Provide a mechanical lift device		✓	med	med	low

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Tightening tie-downs can require excessive force of the hands</li> <li>Operating strapper</li> <li>One handed manual shrink wrapper</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide tie-downs that are equipped with a ratcheting mechanism to eliminate excessive pulling force when tightening</li> </ul>		✓	med	med	high
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide strapper with a better gearing ratio which requires less force</li> </ul>		✓	med	low	med
		34. Maintain hand tool/power tools <ul style="list-style-type: none"> <li>maintain strappers to reduce forces</li> </ul>	✓		low	low	low
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide two-handed manual shrink wrapper</li> <li>provide an automatic shrink wrapper</li> </ul>		✓	med	low	med
				✓	high	med	high

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Operating strapper</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide strapper with a better gearing ratio which requires less force</li> </ul>		✓	med	low	med
		34. Maintain hand tool/power tools <ul style="list-style-type: none"> <li>maintain strappers to reduce forces</li> </ul>	✓		low	low	low
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Handling products with hard edges</li> </ul>	93. Provide appropriate gloves	✓		low to med	low	low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> </ul>	23. Increase room temperature <ul style="list-style-type: none"> <li>encourage employees to keep doors shut</li> </ul>	✓		low	low	low
		93. Provide appropriate gloves <ul style="list-style-type: none"> <li>provide thin gloves with high friction surface (e.g., rubber dots)</li> </ul>	✓		low	low	low
		12. Encourage appropriate seasonal clothing	✓		low	low	low

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	• Material is too low	124. Raise the work piece/work surface	✓	✓	low	low	low
		<ul style="list-style-type: none"> <li>place empty pallets under the active pallet to increase the height during loading/unloading</li> <li>provide a lift table to elevate the active pallet</li> </ul>			high	low	med
	• Material is too far from the edge of the pallet	38. Move closer to the work location.	✓		low	low	med
		<ul style="list-style-type: none"> <li>provide unobstructed access to at least three, preferably four sides of the pallet</li> </ul>					
	• Shrink wrapping	127. Reduce depth of storage container		✓	med	low	med
		<ul style="list-style-type: none"> <li>provide containers (tri-wall) with removable sides to allow better access</li> <li>provide containers with drop down flaps</li> </ul>		✓	med	low	med
		124. Raise the work piece/work surface		✓	med	low	med
		<ul style="list-style-type: none"> <li>provide a height adjustable table for shrink wrapping</li> </ul>					

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Obtaining tangled tie-downs from containers can require repeated bending</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>provide containers that have a side latched spring</li> <li>provide a rack for hanging tie-downs after use to eliminate tangling</li> </ul> 11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>reduce the use of tie-down netting; use shrink wrap whenever feasible</li> </ul> 146. Angle the work surface <ul style="list-style-type: none"> <li>tilt the container for easier access</li> </ul>	✓	✓       	low  med  high  med	low  low  low  low	med  med  high  med
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Inappropriate positioning of pallets may increase twisting</li> <li>Access to all sides of pallet is limited</li> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	82. Provide adequate work space <ul style="list-style-type: none"> <li>place enough space between pallets so that employee is required to turn the entire body and take a step, rather than twist the back</li> </ul> 38. Move closer to the work location. <ul style="list-style-type: none"> <li>provide unobstructed access to at least three, preferably four side of the pallet</li> </ul>	✓      	✓      	low    	low    	low    med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		146. Angle the worksurface <ul style="list-style-type: none"> <li>• tilt the container for easier access</li> </ul>	✓		low	low	low
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>• provide training on ergonomics principles and materials handling techniques</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>• encourage person to use legs to pivot while transferring loads or loading/unloading pallets</li> </ul>	✓		low	low	low
14. High speed, sudden movements or lifting awkward, uneven, shifting, or bulky items.	<ul style="list-style-type: none"> <li>• Manual handling of large, bulky items</li> <li>• Tightening tie-downs can require excessive force and jerking motions</li> <li>• Obtaining tangled tie-downs from containers can require repeated forceful exertions</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>• provide a hoist or other lifting device for handling large items</li> </ul>		✓	high	low	low
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>• provide tie-downs that are equipped with a ratcheting mechanism – minimize excessive pulling force for tightening</li> </ul>		✓	med	med	high
		<ul style="list-style-type: none"> <li>• provide a rack for hanging tie-downs after use to eliminate tangling</li> </ul>		✓	med	low	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>• eliminate the use of tie-down netting; use shrink wrap</li> </ul>		✓	high	low	high



### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"><li>Throwing tie-down netting over tall loads creates uneven force in the back</li><li>Operating strapper</li></ul>	13. Encourage ergonomic work techniques	✓		low	low	low
		61. Provide a mechanical lift device					
		<ul style="list-style-type: none"><li>use a fork truck to lift and position netting over the load</li><li>provide a special portable rack for positioning the netting over the load</li></ul>		✓	med	low	med
				✓	med	med	med
		149. Provide appropriate tools					
		<ul style="list-style-type: none"><li>provide strapper with a better gearing ratio which requires less force</li></ul>		✓	med	low	med
		34. Maintain hand tool/power tools	✓				
		<ul style="list-style-type: none"><li>maintain strappers to reduce forces</li></ul>			low	low	low
15. Static, awkward back postures	<ul style="list-style-type: none"><li>One handed manual shrink wrapper</li></ul>	149. Provide appropriate tools <ul style="list-style-type: none"><li>provide an automatic shrink wrapper</li></ul>		✓	high	med	high

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Lifting forces	<ul style="list-style-type: none"> <li>Item(s) being transferred between pallets are too heavy</li> <li>Inappropriate manual handling of pallets</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>use a hoist to perform the lift</li> <li>use a portable pneumatic scissor jack; position the height of the jack so the operator can slide rather than lift the item between pallets</li> </ul>		✓ ✓	high high	low low	low low
		61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>use a fork truck to move and position empty pallets</li> </ul>	✓		low	low	low
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>consider storing pallets on sides as opposed to flat if handled manually</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>avoid throwing pallets on top of stacks</li> </ul>	✓		low	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Tightening tie-downs can require excessive pulling forces</li> <li>Obtaining tangled tie-downs from containers can require repeated forceful pulling efforts</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide tie-downs that are equipped with a ratcheting mechanism; eliminate excessive pulling force for tightening</li> </ul>		✓	med	med	high
		147. Provide an alternate container <ul style="list-style-type: none"> <li>after use in the field, fold tie downs in a pattern which minimizes tangling</li> </ul>	✓		low	low	med
		<ul style="list-style-type: none"> <li>provide a rack for hanging tie-downs after use to eliminate tangling</li> </ul>		✓	med	low	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>reduce the use of tie-down netting; use shrink wrap whenever feasible</li> </ul>	✓	✓	high	low	high
					low	low	low
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Material is too low, some kneeling on pallets or items may create contact stress to the knees</li> </ul>	124. Raise the work piece/work surface	✓		low	low	low
		<ul style="list-style-type: none"> <li>place empty pallets under the active pallet to increase the height during loading/unloading</li> <li>provide a lift table to elevate the active pallet</li> </ul>		✓	high	low	low
		9. Eliminate exposure to hard edges	✓		low	low	low
		<ul style="list-style-type: none"> <li>cover any sharp edges with padding if kneeling must occur</li> <li>provide knee pads if kneeling must occur</li> </ul>		✓	med	low	low
	<ul style="list-style-type: none"> <li>Standing or walking on a hard surface</li> </ul>	96. Provide appropriate shoe inserts	✓		low to med	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Material is too low/some squatting may be required</li> </ul>	124. Raise the work piece/work surface	✓		low	low	low
		<ul style="list-style-type: none"> <li>place empty pallets under the active pallet to increase the height during loading/unloading</li> <li>provide a lift table to elevate the active pallet</li> </ul>		✓	high	low	low

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Work too low</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>place empty pallets under the active pallet to increase the height during loading/unloading</li> <li>provide a lift table to elevate active pallet</li> </ul>	✓		low	low	low
				✓	high	low	low

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see, light levels too low or too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>Light levels should be 20fc to 50fc for work</li> </ul>		✓	low to high	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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## CASE STUDY – Patient Handling


### TASK TITLE: Patient Handling

<b>Task Description:</b>	<p>The Patient Handling task can occur during medical procedures, patient care on the ward or in outpatient clinics. Patient handling can include transferring the patient from one surface to another, turning and repositioning a patient in a chair or bed, and holding a patient while grooming them. A person performing patient handling can work unassisted or assisted by another person or can use a mechanical lifting device.</p> <p>Patient handling can occur in the following locations:</p> <ul style="list-style-type: none"><li>• Hospital</li><li>• Medical Clinic</li><li>• Dental Clinic</li></ul>
<b>Job Performance Measures Most Often Impacted by Patient Handling:</b>	<p>Measures of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Quality of the patient transfer</li><li>• Patient safety and comfort</li><li>• Efficiency of patient transfer (time required to complete transfer)</li></ul>
<b>Typical Employee Comments about Patient Handling:</b>	<p>Employees typically experience discomfort in the back/torso and legs/feet.</p> <p>The back/torso and legs/feet are the body areas that most commonly receive a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	Biomechanical Lifting Analysis, Push/Pull Force Analysis

**Note:** For patient handling tasks, proper ergonomic work techniques include both the body motions used by the employee and the instructions provided to the patient. Many patients can be educated to assist the employee in performing the transfer. This education generally focuses on methods that have patients use their legs to assist with the movement. It is important for the employee to communicate clearly with the patient so that the efforts are coordinated.



## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Bed-Stretcher transfer: draw sheet not wide enough</li> </ul> 	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a draw sheet wide enough to overlap stretcher and eliminate the need to reach and bend</li> </ul>	✓		low	med	med
	<ul style="list-style-type: none"> <li>Patient is too far away</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>stand closer to the patient when repositioning or transferring the patient</li> <li>use a draw sheet to turn the patient</li> </ul>	✓		low	med	med
		132. Remove obstructions <ul style="list-style-type: none"> <li>move wheel chairs, commodes, and stretchers close the bed prior to transferring the patient</li> </ul>	✓		low	med	med
		42. Obtain patient's assistance <ul style="list-style-type: none"> <li>ask the patient to move closer to the edge before handling the patient</li> </ul>	✓		low	med	med


### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Obstruction restricts smooth movement across</li> </ul>	132. Remove obstructions <ul style="list-style-type: none"> <li>ensure person removes foot supports or moves foot supports out of the way when transferring and repositioning the patient in the wheelchair</li> <li>ensure person removes armrest that is closest to the bed to provide a clear path to transfer the patient</li> </ul> 148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide wheelchairs and commodes that have removable armrests and footrests</li> </ul>	✓          ✓	✓          ✓	low          med	med          med	med          med

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/ carrying materials	• Patient is too heavy	61. Provide a mechanical lift device		✓	high	med	med
		142. Use two or more persons to perform the transfer	✓		low	med	med
		4. Change lifting/carrying task into a rolling or sliding task • provide a sliding board		✓	low to med	med	med
		11. Eliminate unnecessary tasks • try to reduce unnecessary transfers by using platform scales and examining the work procedure	✓		low	low	low
	• Reposition patient on bed	4. Change a lifting/carrying task into a rolling or sliding task • provide a sliding board	✓	✓	low to med	med	med
		142. Use two or more persons to perform the transfer		✓	high	med	med
		61. Provide a mechanical lift device	✓		low	med	med
	• Patient rigid or unable to assist.	142. Use two or more persons to perform the transfer		✓	high	med	med

## Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Manual bed adjustments (crank)</li> </ul> 	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide power adjustments for bed</li> </ul>		✓	high	high	high
	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low	med	med
		119. Provide wheels <ul style="list-style-type: none"> <li>install appropriate wheels</li> </ul>	✓		med	med	med
	<ul style="list-style-type: none"> <li>Stretcher is too heavy to be pushed manually</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide a stretcher or mechanical-lifting device that is lighter in weight and easier to push</li> </ul>		✓	high	med	med
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low high med	med med med	med med med

## Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"><li>Carry distance is more than three steps</li></ul>	126.Reduce carry distance					
		<ul style="list-style-type: none"><li>position frequently used equipment next to patient</li></ul>	✓		low	med	med
		48. Provide a cart					
		<ul style="list-style-type: none"><li>place infants in bassinets to transport around area or between rooms</li></ul>	✓		low	med	med
		<ul style="list-style-type: none"><li>provide a cart to transport equipment and materials</li></ul>		✓	high	med	med
		<ul style="list-style-type: none"><li>use IV poles to carry patient equipment while moving and transporting patient</li></ul>	✓		low	med	med
		<ul style="list-style-type: none"><li>attach IV poles to stretchers/ carts/wheel chairs when possible</li></ul>	✓		low to med	high	high
		37. Modify facilities to decrease handling					
		<ul style="list-style-type: none"><li>widen doors to allow stretchers and wheelchairs to be moved into bathrooms and patient rooms</li></ul>		✓	high	high	high

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lift</li> <li>Item is stuck in location or difficult to move</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling patient or equipment</li> </ul>					
		42. Obtain patient's assistance	✓		low	med	med
		61. Provide a mechanical lift device					
		<ul style="list-style-type: none"> <li>use a lift device for handling dependent patients</li> </ul>		✓	med	med	med
		128. Reduce force required to install or remove the component					
		<ul style="list-style-type: none"> <li>use lubricant to maintain cranks on beds</li> <li>ensure wheelchair components such as footrests and armrests and bed components are maintained.</li> <li>modify the design of wheelchair components such as armrests and footrests to reduce forces during installation or removal</li> </ul>	✓ ✓	✓	low med high	med med high	med med high
		148. Provide appropriate equipment					
		<ul style="list-style-type: none"> <li>provide electric beds where feasible</li> </ul>		✓	high	high	high

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Patient too low</li> </ul>	123.Raise the person <ul style="list-style-type: none"> <li>raise the bed or stretcher to elbow height</li> <li>raise the head of the bed so the patient is upright or elevated</li> </ul>	✓		low	low	low
			✓		low	low	low

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Patient is difficult to grasp due to               <ul style="list-style-type: none"> <li>- patient pain</li> <li>- medical condition</li> </ul> </li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide a transfer belt - position belt around the patient when repositioning patient in chair, transferring or walking with patient. Handles should be rounded and 1-1½" (2.5-3.8cm) in diameter</li> <li>use draw sheet to reposition patient while in bed or on the stretcher</li> </ul>	✓		low	low	low
			✓		low	low	low
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					



## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Patient is difficult to grasp due to <ul style="list-style-type: none"> <li>- patient pain</li> <li>- medical condition</li> </ul> </li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide a transfer belt and position belt around the patient when repositioning patient in chair, transferring or walking with patient. Handles should be rounded and 1-1½" (2.5-3.8cm) in diameter</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>use draw sheet to reposition the patient while in bed or on the stretcher. Roll up edge of draw sheet to form handle</li> </ul>	✓		low	low	low
		13. Encourage work ergonomic work techniques <ul style="list-style-type: none"> <li>ensure patient is dry prior to moving or transferring the patient <ul style="list-style-type: none"> <li>- dry patient in bath or commode chair</li> </ul> </li> </ul>	✓		low	low	low
		61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>use a mechanical lifting aid to remove patient from bath</li> </ul>		✓	high	med	med
		4. Change lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>provide a sliding board</li> </ul>		✓	low to med	med	med

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Speed of lift</li> <li>Item is stuck in location or difficult to move</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling patient or equipment</li> </ul>					
		61. Provide a mechanical lift device		✓	med to high	med	med
		<ul style="list-style-type: none"> <li>use a lift device for handling dependent patients</li> </ul>					
		128.Reduce force required to install or remove the component	✓		low	med	med
		<ul style="list-style-type: none"> <li>use lubricant to maintain cranks on beds</li> <li>ensure wheelchair components such as footrests and armrests and bed components are maintained.</li> <li>modify the design of wheelchair components such as armrests and footrests to reduce forces during installation or removal</li> </ul>	✓		med	med	med
		148.Provide appropriate equipment		✓	high	high	high
		<ul style="list-style-type: none"> <li>provide electric beds where feasible</li> </ul>			high	high	high

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Exposed edges on lifting equipment</li> </ul>	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>cover or wrap hard edges</li> </ul>	✓		low	low	low
		148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide equipment without exposed hard edges</li> </ul>		✓	med to high	low	low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	• Patient is too low	123. Raise the person					
		• raise the bed or stretcher to just below elbow height when repositioning or transferring the patient	✓		low	low	low
	• Patient is too far away	• raise the head of the bed to elevate the patient into an upright position	✓		low	low	low
		38. Move closer to the work location					
		• move the patient closer to the edge of the bed	✓		low	low	low
	• Bed-Stretcher transfer: draw sheet not wide enough	132. Remove obstructions	✓		low	low	low
		149. Provide appropriate tools					
		• provide a draw sheet wide enough to overlap stretcher and eliminate the need to reach and bend	✓		low	med	med
	• Manual transfer of patient	61. Provide a mechanical lift device		✓	med to high	med	med
		13. Encourage ergonomic work techniques					
		• provide training on ergonomics principles and lifting techniques	✓		low	low	low
		• encourage person to use leg muscles to lift	✓		low	low	low
		42. Obtain patient's assistance	✓		low	med	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Access to the patient (who needs to be handled) is restricted</li> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	82. Provide adequate work space <ul style="list-style-type: none"> <li>remove furniture and equipment that may restrict access to the patient</li> </ul>	✓		low	low	low
		61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide mechanical assistance for handling the patient</li> <li>use lift devices which transport patients in an upright posture</li> </ul>		✓	high	med	med
				✓	high	high	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use legs to pivot when handling a load</li> </ul>	✓		low	low	low
			✓		low	low	low
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Bed-Stretcher transfer: draw sheet not wide enough</li> <li>Manual transfer of patient between bed-wheel chair or wheel chair-toilet</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>provide a draw sheet wide enough to overlap stretcher and eliminate the need to reach and bend</li> </ul>	✓		low	med	med
		61. Provide a mechanical lift device		✓	med to high	med	med
		142. Use two or more persons to perform the transfer	✓		low	low	low
		42. Obtain patient's assistance	✓		low	low	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Item is stuck in location</li> <li>Item is difficult to install or remove</li> </ul>	128.Reduce force required to install or remove component	✓				
		<ul style="list-style-type: none"> <li>use lubricant to maintain cranks on beds</li> </ul>			low	med	med
		35. Maintain tracks, rollers, and movement mechanisms.					
		<ul style="list-style-type: none"> <li>ensure wheelchair components such as footrests and armrests, and bed components are maintained</li> <li>modify design of wheelchair components such as armrests and footrests to reduce forces during installation or removal</li> </ul>		✓	high	med	med
	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> <li>Person loses control of the patient</li> </ul>	148.Provide appropriate equipment					
		<ul style="list-style-type: none"> <li>provide electric beds where feasible</li> </ul>		✓	high	med	med
		13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use smooth fluid motions when transferring patient</li> <li>encourage person to slowly lower the individual to the floor surface rather than trying to regain control if the patient falls</li> </ul>	✓		low	low	low
		42. Obtain patient's assistance	✓		low	med	med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Patient positioned too low</li> </ul>	123.Raise the person	✓		low	low	low
		<ul style="list-style-type: none"> <li>raise the bed or stretcher to just below elbow height when repositioning or transferring the patient</li> <li>raise the head of the bed to elevate the patient into an upright position</li> </ul>	✓		low	low	low
16. Lifting forces	<ul style="list-style-type: none"> <li>Patient too heavy</li> </ul>	61. Provide a mechanical lift device		✓	high	med	med
		142.Use two or more persons to perform the transfer	✓		low	med	med
		11. Eliminate unnecessary tasks	✓		low	low	low
	<ul style="list-style-type: none"> <li>Bed-Stretcher transfer: high friction surface</li> </ul>	4. Change lifting/carrying task into a rolling or sliding task		✓	low to med	med	med
		<ul style="list-style-type: none"> <li>provide a sliding board</li> </ul>					




### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Patient is difficult to grasp due to               <ul style="list-style-type: none"> <li>- patient pain</li> <li>- medical condition</li> </ul> </li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide a transfer belt and position belt around the patient when repositioning patient in chair, transferring or walking with patient. Handles should be rounded and 1-1½" (2.5-3.8cm) in diameter</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>use draw sheet to reposition the patient while in bed or on the stretcher. Roll up edge of draw sheet to form handle</li> </ul>	✓		low	low	low
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>ensure patient is dry prior to moving or transferring the patient               <ul style="list-style-type: none"> <li>- dry patient in bath or commode chair</li> </ul> </li> </ul>	✓		low	low	low
		61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>use a mechanical lifting aid to remove patient from bath</li> </ul>		✓	high	med	med



## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>High forces are required to lift or lower the patient</li> </ul>	35. Maintain tracks, rollers, and movement mechanisms	✓		low	low	low
		<ul style="list-style-type: none"> <li>ensure wheelchair components such as footrests and armrests, and bed components are maintained</li> </ul>					
		148. Provide appropriate equipment	✓	✓	high	med	med
		<ul style="list-style-type: none"> <li>provide electric beds where feasible</li> <li>modify the design of wheelchair components such as armrests, and footrests to reduce forces during installation or removal</li> </ul>		✓	high	med	med
		42. Obtain patient's assistance	✓		low	low	low
		61. Provide a mechanical lift device		✓	high	med	med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Bed-Stretcher transfer: high friction surface</li> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	4. Change lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>provide a sliding board</li> </ul>		✓	low to med	med	med
		19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on chairs, stretchers, etc.</li> </ul>	✓		low	low	low
		119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul>	✓		med	med	med
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low high low	med med med	med med med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Standing for long periods</li> </ul>	20. Incorporate rest pauses	✓		low	low	low
		25. Increase task variety <ul style="list-style-type: none"> <li>alternate work tasks to avoid handling patients for extended periods of time</li> </ul>	✓		low	low	low
20.Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Standing on a hard surface</li> </ul>	96. Provide appropriate shoe inserts	✓		low	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Patient is too low</li> </ul>	124.Raise the work piece /work surface <ul style="list-style-type: none"> <li>raise the bed or stretcher so that the patient is at or just below elbow height</li> </ul>	✓		low	med	med
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Repeated crouching</li> <li>Work too low</li> <li>Manual bed adjustment (crank)</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide electric beds where feasible</li> </ul>		✓	high	high	high

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>Light levels should be 100fc to 150fc for work</li> </ul>		✓	low to high	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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## CASE STUDY – Picking/Stocking

### TASK TITLE: Picking/Stocking

<b>Task Description:</b>	<p>The Picking/Stocking task involves the placement and retrieval of items for storage areas. These storage areas are typically shelves or carousels. This can include storing small items inside bins, as well as larger boxes on pallets. In some cases the Picking/Stocking tasks are performed using a standing fork truck. In these cases the Fork Truck Standing Case Study should be referenced as well.</p> <p>Typical areas in which the Picking/Stocking task may be found can include:</p> <ul style="list-style-type: none"><li>• Logistics</li><li>• CE Warehouse</li><li>• Commissary Warehouse</li></ul>
<b>Job Performance Measures Most Often Impacted by Picking/Stocking:</b>	<p>Measure of work performance can include (not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Orders filled per day</li></ul>
<b>Typical Employee Comments about Picking/Stocking:</b>	<p>Employees typically experience discomfort in the lower or middle back, attributed to lifting.</p> <p>The back/torso is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	NIOSH Lifting Equation, Biomechanical Lifting Analysis, Grip Force Analysis

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Object too high</li> <li>Object is too far away</li> </ul>	32. Lower the work piece/work surface					
		<ul style="list-style-type: none"> <li>place the heaviest items between shoulder height (50 in.)(127 cm) and knuckle height (25 in.)(64 cm)</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>place the most frequently accessed items on middle shelves of storage racks</li> </ul>	✓		low	med	med
		123. Raise the person					
		<ul style="list-style-type: none"> <li>use a standing fork truck or portable stairs to access items stored above shoulder height</li> </ul>	✓	✓	low to med	med	low
		38. Move closer to the work location					
		<ul style="list-style-type: none"> <li>step into the rack when possible</li> </ul>	✓		low	low	low
		41. Move work piece closer to body	✓		low	low	low
		<ul style="list-style-type: none"> <li>reposition stock on the close side of the pallet</li> </ul>	✓		low	low	low
		55. Provide a hook-type tool to pull items		✓	med	med	med
		127. Reduce depth of storage container		✓	med	low	low
		<ul style="list-style-type: none"> <li>reduce depth of stock placed on pallets in the pick tunnel</li> </ul>					

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/ carrying materials	• Item is too heavy	61. Provide a mechanical lift device		✓	med	low	low
		4. Change a lifting/carrying task into a rolling or sliding task					
		• use a height adjustable cart to retrieve and deliver objects – the operator can slide objects rather than lift	✓	✓	low to med	med	med
		142. Use two or more persons to perform the transfer	✓		low	low	low
		131. Reduce weight of work piece	✓	✓	low to high	low	low
	• Item is stuck or wedged in place	• reduce number of items lifted at same time					
		37. Modify facilities to decrease handling					
		• install an automated retrieval storage system (AR/RS) or mechanized (carousel) picking/stocking system		✓	high	med	high
		13. Encourage ergonomic work techniques					
		• take time to remove obstacles interfering with movement rather than trying to “force the object free	✓		low	low	low
		55. Provide a hook-type tool to pull items		✓	med	med	med



### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding/carrying materials	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart causes high forces</li> </ul>	119. Provide wheels		✓	med	low	med
		19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low to med	low	high
	<ul style="list-style-type: none"> <li>Pulling object across shelf results in high forces</li> </ul>	37. Modify facilities to decrease handling <ul style="list-style-type: none"> <li>use flow racks to cue items to the front of a storage rack</li> </ul>		✓	high	low	high
		131. Reduce weight of work piece <ul style="list-style-type: none"> <li>reduce number of items or weight of items on cart</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Cart or piece of equipment is too heavy to be pushed manually</li> </ul>	67. Provide a powered cart <ul style="list-style-type: none"> <li>provide a powered cart or have the object moved by using a fork truck</li> </ul>		✓	high	low	high
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> </ul>	✓ ✓		low med to high med to high	med med	med med
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	<ul style="list-style-type: none"> <li>provide ramps to compensate for minor differences in floor height</li> </ul>		✓		low	low

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Carry distance is more than three steps</li> </ul>	37. Modify facilities to decrease handling <ul style="list-style-type: none"> <li>arrange storage and work areas in a hub configuration to reduce travel distance</li> </ul>		✓	high	low	high
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lift</li> </ul>	55. Provide a hook-type tool to pull items		✓	med	med	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to avoid rushing while handling items</li> </ul>	✓		low	low	low
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Inadequate head room causes awkward postures</li> </ul>	82. Provide adequate work space	✓		low	med	med
		<ul style="list-style-type: none"> <li>store item in area where there is adequate headroom</li> <li>use flow-racks to cue items to the front of a storage rack</li> </ul>		✓	high	med	high
		55. Provide a hook-type tool to pull products off of deep shelves		✓	med	med	med

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Gripping item results in awkward wrist positions</li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide cut-outs on boxes or containers</li> </ul>		✓	med	low	med
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> <li>Item has no handles</li> <li>Item is slippery</li> </ul>	94. Provide appropriate handles		✓	med	med	med
		147. Provide an alternate container <ul style="list-style-type: none"> <li>provide a smaller container</li> </ul>		✓	low to med	med	med
		<ul style="list-style-type: none"> <li>request vendor supply items in a container with handles</li> </ul>		✓	med	med	med

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding task	✓	✓	low to med	med	med
		<ul style="list-style-type: none"> <li>use a height adjustable cart to retrieve and deliver objects – the operator can slide objects rather than lift</li> </ul>					
		61. Provide a mechanical lift device		✓	med	low	med
		142. Use two or more people to perform the transfer	✓		low	low	low
		131. Reduce weight of work piece	✓	✓	low to high	low	low
	<ul style="list-style-type: none"> <li>Item is stuck or wedged in place</li> </ul>	<ul style="list-style-type: none"> <li>request vendor ship unit on smaller bulk items or divide unit into multiple packages</li> </ul>	✓				
		93. Provide appropriate gloves	✓		low to med	med	low
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Tearing open boxes</li> </ul>	93. Provide appropriate gloves					
		<ul style="list-style-type: none"> <li>use gloves with a high friction surface to improve the grip on slippery objects</li> </ul>					
		148. Provide appropriate equipment	✓		low	med	med
		<ul style="list-style-type: none"> <li>use a knife for opening boxes</li> </ul>					

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Item has small handles</li> <li>Handles have hard edges</li> </ul>	88. Provide an appropriate handle diameter	✓		low	med	med
		<ul style="list-style-type: none"> <li>provide a wrap around the handle so that the diameter is no less than 1-1.5" (2.5-3.8cm)</li> </ul>					
		94. Provide appropriate handles		✓	low to med	low	low
		<ul style="list-style-type: none"> <li>provide rounded slightly compressible handles</li> </ul>		✓	med to high	med	med
		61. Provide a mechanical lift device					
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold, for instance picking up stock in a freezer</li> </ul>	12. Encourage appropriate seasonal clothing	✓		low to med	med	med
		93. Provide appropriate gloves	✓		low to med	med	med

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Object is too low</li> </ul>	124. Raise the work piece/work surface	✓		low	med	med
		• place heaviest items between mid thigh and shoulder height		✓	med	med	med
		• provide a fixed table to support work piece		✓	med to high	med to high	med to high
		• provide an adjustable table or scissor lift for work piece		✓	med	med	med
		• raise the height of the transfer cart or use a spring loaded cart					
		13. Encourage ergonomic work techniques					
		• avoid storing items on lowest cart shelves	✓		low	med	med

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Object is too far away</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>step closer to load</li> </ul>	✓		low	med	low
		41. Move work piece closer to person <ul style="list-style-type: none"> <li>slide load to edge before lifting</li> </ul>	✓		low	med	low
		37. Modify facility to decrease handling <ul style="list-style-type: none"> <li>use flow-racks to cue items to the front of a storage rack</li> </ul>		✓	med to high	low	med
		<ul style="list-style-type: none"> <li>install an automated retrieval storage system (AR/RS) or mechanized (carousel) picking/stocking system</li> </ul>		✓	high	med	high
	<ul style="list-style-type: none"> <li>Lifting item out of a deep container causes awkward bending</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>provide a smaller container</li> <li>use a container with drop down sides</li> </ul>	✓	✓	low med to high	med med	med med
		<ul style="list-style-type: none"> <li>use a pallet instead of a bin</li> </ul>		✓	med to high	med	med

## **Back/Torso (cont'd)**


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person tends to use the back to lift instead of using the legs to assist in the lift. Check to make sure that there is no contributing factor in the workplace</li> </ul>	124. Raise the work piece/work surface	✓		low	med	med
		<ul style="list-style-type: none"> <li>place heaviest items between mid thigh and shoulder height</li> </ul>		✓	med	med	med
		<ul style="list-style-type: none"> <li>provide a fixed table to support work piece</li> </ul>		✓	med to high	med to high	med to high
		<ul style="list-style-type: none"> <li>provide an adjustable table or scissors lift for work piece</li> </ul>		✓	med	med	med
		13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use leg muscles to lift</li> </ul>	✓		low	low	low
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Work area layout</li> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	130. Reduce the angle a person has to turn to transfer the item	✓		low to high	low	med
		<ul style="list-style-type: none"> <li>if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> <li>reposition supplies/materials to reduce twisting</li> </ul>	✓		low to med	low	low



### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Item is bulky, awkward and/or shifts easily</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>store bulky and awkward items on pallets and use a fork truck to move them</li> </ul>		✓	med	low	low
		142. Use two or more persons to perform the transfer	✓		low	low	low
		4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>use a height adjustable cart to retrieve and deliver objects – the operator can slide objects from the shelves on to and off the cart</li> </ul>		✓	low to med	med	med
	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>contact vendor and request re-packing object in container with handles or increasing object density</li> </ul>		✓	med	low	low

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Object located too low</li> </ul> 	124. Raise the work piece/work surface	✓		low	low	med
		<ul style="list-style-type: none"> <li>place heaviest items between knuckle and shoulder height (25"-50") (64-127 cm)</li> </ul>	✓		low	med	med
		<ul style="list-style-type: none"> <li>provide a fixed table to support work piece</li> </ul>		✓	high	med	med
		38. Move closer to the work location	✓		low	low	med
		<ul style="list-style-type: none"> <li>remove obstructions</li> </ul>	✓		low	low	low
		41. Move the work piece closer to person					

## **Back/Torso (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Picking/stocking from a low location</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>place the heaviest items between knuckle and shoulder height and on middle shelves of storage racks</li> <li>provide an adjustable table</li> <li>raise the height of the transfer cart or use a spring loaded cart</li> </ul>	✓	✓  ✓ ✓	low  med to high med	med  med med	med  med med
16. Lifting forces	<ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>use a height adjustable cart to retrieve and deliver objects – the operator can slide objects from the shelves on to and off the cart</li> </ul> 61. Provide a mechanical lift device 142. Use two or more persons to perform the transfer 131. Reduce weight of work piece <ul style="list-style-type: none"> <li>request vendor ship unit on smaller bulk items or divide unit into multiple packages</li> </ul>	✓  ✓  ✓	✓  ✓  ✓	high low  med low  low to high	med low  low low  low	med low  low low  low

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
		37. Modify facilities to decrease handling • install an automated retrieval storage system (AR/RS) or mechanized (carousel) picking/stocking system		✓	high	med	high
17. Pushing or pulling	• Rolling/sliding resistance of cart or piece of equipment causes high forces  • Floor/surface condition causes high forces during a rolling or sliding task	19. Improve wheel condition • repair wheels on carts or equipment	✓		low	low	med
		119. Provide wheels • provide wheels with appropriate bearings and tread composition	✓		low	low	med
		67. Provide a powered cart • provide motorized assistance to transport cart or piece of equipment		✓	med to high	med	med
		17. Improve floor condition • improve housekeeping • repair cracks or gaps in floor • provide ramps to compensate for minor differences in floor height	✓ ✓	✓	low med med	med med med	med med med
18. Whole body vibration	• Rarely occurs	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Standing in one position</li> </ul>	25. Increase task variety	✓		low	low	low
		20. Incorporate rest pauses	✓		low	low	med
20. Standing on hard surfaces or exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> <li>Standing on hard surface</li> <li>Leaning against bin during loading</li> </ul>	86. Provide an appropriate anti-fatigue mat		✓	med	low	low
		96. Provide shoe inserts	✓		low to med	low	low
		147. Provide an alternate container <ul style="list-style-type: none"> <li>use smaller container</li> </ul>	✓		low to med	low	med
		<ul style="list-style-type: none"> <li>use a container with drop down sides</li> </ul>		✓	med to high	low	med
		<ul style="list-style-type: none"> <li>use a pallet instead of a bin</li> </ul>		✓	low	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Work object is too low</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>provide support for the work piece</li> </ul>	✓		low to med	med	med
		<ul style="list-style-type: none"> <li>provide an adjustable table for work piece</li> </ul>		✓	med to high	med	med
		<ul style="list-style-type: none"> <li>store frequently accessed items between 25"-50" (64-127 cm)</li> </ul>	✓		low	med	med

### Legs/Feet (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Climbing/descending ladder stairs to access taller shelves (particularly when carrying a load)</li> </ul>	148. Provide appropriate equipment		✓	high	med	med
		<ul style="list-style-type: none"> <li>use a standing fork truck for shelves instead of portable ladders</li> <li>use a ladder/lift cart combination allowing the person to climb and descend without holding the object</li> </ul>		✓	med	med	med
		142. Use two or more persons to perform the transfer	✓		low	low	low
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Work object is too low</li> </ul>	124. Raise the work piece/work surface		✓	low to med	med	med
		<ul style="list-style-type: none"> <li>provide support for the work piece</li> <li>provide an adjustable table for work piece</li> </ul>		✓	med to high	med	med
		148. Provide appropriate equipment		✓	med	low to med	low to med
		<ul style="list-style-type: none"> <li>use a ladder with at least 12" (30.5cm) deep steps in place of the small rungs</li> </ul>					

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Low light level due to location of the component</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>provide a portable task light that can be moved around the area or clamped onto a support work surface to improve light levels (75fc to 100fc)</li> </ul>	✓		low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A		✓	med	med	med

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## CASE STUDY - Scanning/Bar Code Reading (Hand Held)


### TASK TITLE: Scanning/Bar Code Reading (Hand Held)

<b>Task Description:</b>	<p>The Scanning/Bar Code Reading (Hand Held) task typically occurs in warehouses in order to track incoming or outgoing items. The employee uses a hand held scanner to read bar codes that may be attached to a container or on the paperwork. The employee may scan directly on boxes or scan paperwork while sitting at a work desk.</p> <p>Typical areas in which the Scanning/Bar Code Reading (Hand Held) task may be found can include:</p> <ul style="list-style-type: none"><li>• Receiving Operations</li><li>• Picking</li></ul>
<b>Job Performance Measures Most Often Impacted by Scanning/Bar Code Reading (Hand Held):</b>	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Items processed per day</li></ul>
<b>Typical Employee Comments about Scanning/Bar Code Reading (Hand Held):</b>	<p>Employees rarely attribute discomfort to the scanning task.</p> <p>The hands/wrists/arms is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	Postural Analysis

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Object is too high</li> </ul>	32. Lower the work piece / work surface <ul style="list-style-type: none"> <li>reduce the conveyor height</li> </ul>		✓	med to high	low	med
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Positioning of items</li> </ul>	41. Move work piece closer to body <ul style="list-style-type: none"> <li>position the bar codes on the side of the box instead of the top</li> </ul>	✓		low	med	high
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Inspecting inside boxes</li> </ul>	32. Lower the work piece / work surface <ul style="list-style-type: none"> <li>use an adjustable height table or conveyor section</li> </ul>		✓	med to high	med	med

## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Scanning from labels placed flat on the desk surface</li> </ul> 	146. Angle the work surface <ul style="list-style-type: none"> <li>Use a document holder or angled stand to support the labels during scanning</li> </ul>	✓		med to low	low	med
		148. Provide appropriate equipment <ul style="list-style-type: none"> <li>install a surface mounted scanner in the desk, similar to those used by cashiers</li> </ul>		✓	low	med	med
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>select scanner gun models which can read from longer distances and off-center angles</li> </ul>		✓	med to high	med	high
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>rotate boxes to place labels closer to the employee</li> </ul>	✓		low	low	med
		<ul style="list-style-type: none"> <li>consider the label location when placing boxes on conveyors or tables</li> </ul>	✓		low	med	med

### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Scanner has single finger operation</li> </ul>	149. Provide appropriate tools <ul style="list-style-type: none"> <li>select a model with at least two finger activation</li> </ul>		✓	med	med	med
	<ul style="list-style-type: none"> <li>Scanner requires repeated inputs on small keys</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>transfer frequently keyed information into barcodes placed in a book</li> </ul>		✓	med	med	high
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Object is too low</li> <li>Scanning location is too low</li> </ul>	124. Raise the work piece/work surface		✓	med to high	low	med
		<ul style="list-style-type: none"> <li>raise the conveyor</li> <li>provide a fixed table to support work piece</li> </ul>		✓	low to med	low	med
		41. Move work piece closer to body	✓		low	low	med
		<ul style="list-style-type: none"> <li>rotate boxes to place labels closer to the employee</li> <li>consider the label location when placing boxes on conveyors or tables</li> </ul>	✓		low	med	med
		149. Provide appropriate tools		✓	med to high	med	high
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Scanning is performed in a restricted space</li> </ul>	149. Provide appropriate tools		✓	med to high	med	high
		<ul style="list-style-type: none"> <li>select scanner gun models which can read from longer distances and off-center angles</li> </ul>					
		41. Move work piece closer to body	✓		low	low	med
		<ul style="list-style-type: none"> <li>rotate boxes to place labels closer to the employee</li> <li>consider the label location when placing boxes on conveyors or belts</li> </ul>	✓		low	med	med

### **Back/Torso (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
16. Lifting forces	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Standing on a hard surface</li> </ul>	86. Provide an appropriate anti-fatigue mat		✓	med to high	low	low
		96. Provide appropriate shoe inserts		✓	low	low	low
		143. Wear appropriate shoes	✓		low	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Work object is too low</li> </ul>	124. Raise the work piece / work surface		✓	med to high	low	low
		<ul style="list-style-type: none"> <li>provide support for the work piece</li> <li>provide an adjustable table for work piece</li> </ul>		✓	low to med	low	med
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>Light level should be 50fc to 75fc for the work</li> </ul>		✓	low to med	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					



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## **CASE STUDY – Scanning (Groceries) / Tendering Money**

**TASK TITLE:** Scanning (Groceries) / Tendering Money

### **Task Description:**

The Scanning (Groceries) / Tendering Money task may be involved when working in a deli, convenience store or commissary. The tasks involve entering information using a keypad or scanner, handling money and individual items.

Typical jobs in which Scanning (Groceries) / Tendering Money tasks are performed include (but are not necessarily limited to):

- Commissary
- Convenience store
- Restaurant

### **Job Performance Measures Most Often Impacted by Scanning (Groceries) / Tendering Money:**

- Scanning accuracy
- Money collection accuracy

### **Typical Employee Comments about Scanning (Groceries) / Tendering Money:**


Employees typically experience discomfort in the shoulder/neck and hands/wrists/arms, which can be attributed to moving items across scanner.

The shoulder/arms and hands/wrists/arms are the body areas that most commonly receive a “High” priority rating. The remaining areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.

### **Suggested Level II Analysis:**

Elemental Task Analysis

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Object is too high</li> </ul>	32. Lower the work piece / work surface		✓	low to high	med	med
		<ul style="list-style-type: none"> <li>place the keypad on a height and angle adjustable pedestal so that the keypad is shoulder height or lower but does not interfere with the flow of groceries</li> </ul>					
		123. Raise the person	✓		low	low	low
		<ul style="list-style-type: none"> <li>provide a platform or stand</li> </ul>					
	<ul style="list-style-type: none"> <li>Object is too far away</li> </ul> 	13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>instruct individuals to use the conveyor belt to bring groceries as close to the body as possible prior to lifting and handling the grocery item</li> </ul>					
		41. Move work piece closer to body		✓	low to med	low	Med
		<ul style="list-style-type: none"> <li>use a divertor guide to bring groceries close to cashier. The divertor pushes groceries towards the cashier side of the counter as the conveyor moves forward.</li> </ul>					

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
2. Arm forces: Repeated arm forces or holding / carrying materials	<ul style="list-style-type: none"> <li>Raised lip on front of scanner prevents products from sliding</li> <li>Person lifts item for scanning</li> </ul>	35. Maintain tracks, rollers and movement mechanisms					
		<ul style="list-style-type: none"> <li>adjust conveyor belt and scanner to ensure a smooth transition.</li> <li>clean and maintain scanner on a regular basis</li> </ul>	✓		low	high	high
		148. Provide appropriate equipment	✓		low	high	high
		<ul style="list-style-type: none"> <li>provide a scanner which can scan bar codes in different orientations</li> </ul>		✓	high	high	high
		13. Encourage ergonomic work techniques					
		<ul style="list-style-type: none"> <li>encourage person to slide items rather than lifting them, (assumes high quality scanner)</li> </ul>	✓		low	med	med


### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	• Speed of lift	13. Encourage ergonomic work techniques					
		• encourage person to use smooth fluid movements while handling items.	✓		low	low	low
		• encourage person to use smooth fluid movements to move grocery items across scanner	✓		low	low	low
		41. Move work piece closer to body					
		• use a divertor guide to bring groceries close to cashier. The divertor pushes groceries towards the cashier side of the counter as the conveyor moves forward, thus sudden shoulder movements are not required to bring the item to the cashier.		✓	low to med	low	Med


### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Work piece position too low and off to one side</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use conveyor belt to move item directly in front of the body and minimize turning the head to view items positioned away from the scanning area</li> </ul>	✓		low	low	low
		124. Raise the work piece / work surface <ul style="list-style-type: none"> <li>position keypad on a height adjustable pedestal to raise the keypad to a position that does not require severe bending of the neck</li> </ul>		✓	high	med	med
		150.Re-design work space <ul style="list-style-type: none"> <li>position keypad directly in behind and over the conveyor belt so that person can face the groceries on the conveyor rather than looking down and to the right</li> </ul>		✓	low to high	med	med

## Hands/Wrists/Arms


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Shape of item causes awkward wrist positions</li> </ul>  <ul style="list-style-type: none"> <li>Height and angle of keypad causes awkward wrist positions</li> <li>Raised lip on front of scanner prevents products from sliding</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage individual to allow the conveyor to bring the object to the scanner or weight scale</li> <li>use to hands to lift heavy awkward items</li> </ul>	✓		low	low	low
		149. Provide appropriate tools <ul style="list-style-type: none"> <li>investigate the use of a hand held scanner or scanner than can be adjusted to allow the individual to avoid handling the item</li> </ul>	✓		low	low	low
		20. Incorporate rest pauses	✓		low	low	low
		152. Relocate the work <ul style="list-style-type: none"> <li>position keypad on a height and angle adjustable pedestal to improve wrist posture.</li> </ul>		✓	low to med	med	med
		35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>adjust conveyor belt and scanner to ensure a smooth transition.</li> <li>clean and maintain scanner on a regular basis</li> </ul>	✓		low	high	high
			✓		low	high	high

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person lifts item for scanning</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide a scanner which can scan bar codes in different orientations</li> </ul> 13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to slide items rather than lifting them (assumes high quality scanner)</li> </ul>		✓	med to high	high	high
			✓		low	med	med
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Keying information into the keypad causes repeated finger manipulations</li> </ul> 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage individual to use scanner whenever possible to enter product information</li> </ul> 11. Eliminate unnecessary tasks	✓		low	low	low
				✓	high	med	high




## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> </ul> 	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>push instead of grab and lift</li> <li>use two hands to lift heavy or awkward items</li> </ul> 11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>implement an advanced checkout system that has clients scan and process their own items</li> </ul>	✓  ✓	   ✓	low low  high	med low  high	med low  high
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> <li>Item has no handles</li> <li>Raised lip on front of scanner prevents products from sliding</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage the use of the conveyor to transport items as close to the individual as possible</li> <li>use two hands to lift heavy or awkward items</li> <li>leave heavy items in the grocery cart</li> </ul> 35. Maintain tracks, rollers, and movement mechanisms <ul style="list-style-type: none"> <li>adjust conveyor belt and scanner to ensure a smooth transition.</li> <li>clean and maintain scanner on a regular basis</li> </ul>	✓  ✓  ✓	   	low  low  low  low  low	low  low  high  high	low  low  high  high

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person lifts item for scanning</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide a scanner which can scan bar codes in different orientations</li> </ul>		✓	high	high	high
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Scanning groceries</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to slide items rather than lifting them, (assumes high quality scanner)</li> </ul>	✓		low	med	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>implement an advanced checkout system that has clients scan and process their own items</li> </ul>		✓	high	high	high
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Rarely occurs - handling of frozen goods is too low to be considered an exposure</li> </ul>	N/A					

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Object is too low</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>raise conveyor</li> </ul>		✓	high	med	med
	<ul style="list-style-type: none"> <li>Object is too far away</li> </ul>	38. Move closer to the work location <ul style="list-style-type: none"> <li>remove obstructions</li> <li>walk around the counter to handle items located in grocery carts</li> </ul>	✓ ✓		low low	low low	low low
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>use a divertor guide to bring groceries close to cashier, thus pushing groceries towards the cashier side of the counter as the conveyor moves forward.</li> </ul>		✓	low to med	low	med
	<ul style="list-style-type: none"> <li>Lifting item out of a deep container causes awkward bending</li> </ul>	147. Provide an alternate container <ul style="list-style-type: none"> <li>provide shallower grocery carts with detachable edges so that items can be slid out of the cart rather than lifted out of the cart</li> </ul>		✓	high	med	med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person tends to use the back to lift instead of using the legs to assist in the lift (Check to make sure that there is no contributing factor in the workplace)</li> </ul>	11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>place tags on heavy items or replace shelving of item with sample and tags. Scan the tag instead of the item.</li> </ul> 13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and techniques</li> <li>encourage person to use leg muscles to lift</li> </ul>		✓	med to high	low	med
			✓		low	low	low
			✓		low	low	low
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Access is restricted to items that need to be handled</li> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	41. Move work piece closer to body <ul style="list-style-type: none"> <li>use a divertor guide to bring groceries close to cashier. The divertor pushes groceries towards the cashier side of the counter as the conveyor moves forward.</li> </ul> 13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use conveyor to bring item to them</li> <li>provide training on ergonomics principles</li> <li>encourage person to use legs to pivot when handling a load</li> </ul>		✓	low to med	low	med
			✓		low	low	low
			✓		low	low	low
			✓		low	low	low

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements, or lifting awkward, uneven, shifting or bulky items	<ul style="list-style-type: none"> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to use smooth fluid movements while handling items</li> </ul>	✓		low	low	low
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>place tags on heavy items or replace shelving of item with sample and tags. Scan the tag instead of the item.</li> </ul>		✓	high	med	med
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Work positioned too low</li> <li>Items positioned too far from the body</li> </ul>	124. Raise the work piece / work surface <ul style="list-style-type: none"> <li>raise cash counter or grocery counter so that the items are located just below elbow height</li> </ul>		✓	high	med	med
		13. Encourage ergonomic work technique <ul style="list-style-type: none"> <li>encourage individual to allow the item to move closer using the conveyor</li> </ul>	✓		low	low	low
		150. Re-design the work space <ul style="list-style-type: none"> <li>use a divertor to move products closer to the cashier</li> </ul>		✓	med	low	med


### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
16. Lifting forces	<ul style="list-style-type: none"> <li>Item is too heavy</li> <li>Person lifts items for scanning</li> </ul>	41. Move work piece closer to body					
		<ul style="list-style-type: none"> <li>instruct person to use the conveyor belt to bring groceries as close to the body as possible prior to lifting and handling the grocery item</li> </ul>	✓		low	low	low
		11. Eliminate unnecessary tasks	✓		low	low	low
		<ul style="list-style-type: none"> <li>instruct person to encourage customer to leave heavy items in the grocery cart rather than lifting the item from the cart</li> <li>place tags on heavy items or replace shelving of item with sample and tags. Scan the tag instead of the item.</li> </ul>		✓	high	med	med
	<ul style="list-style-type: none"> <li>Raised lip on front of scanner prevents products from sliding</li> </ul>	149. Provide appropriate tools		✓	low to high	low	low
		<ul style="list-style-type: none"> <li>provide a hand scanner so that heavy items can be left in the cart</li> </ul>					
		35. Maintain tracks, rollers, and movement mechanisms	✓		low	high	high
		<ul style="list-style-type: none"> <li>adjust conveyor belt and scanner to ensure a smooth transition.</li> <li>clean and maintain scanner on a regular basis</li> </ul>	✓		low	high	high

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Person lifts item for scanning</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>provide a scanner which can scan bar codes in different orientations</li> </ul> 13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to slide items rather than lifting them (assumes high quality scanner)</li> </ul>	✓	✓	high	high	high
			✓		low	med	med
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Stands in one position</li> </ul>	52. Provide a footrail or footrest <ul style="list-style-type: none"> <li>provide a footrest/footrail that allows the person to periodically raise one leg</li> </ul>		✓	med	low	low

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
20. Standing on hard surfaces or exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> <li>Stands on a hard surface</li> <li>Leans against conveyor frame</li> </ul> 	86. Provide an appropriate anti-fatigue mat		✓	med	med	med
		<ul style="list-style-type: none"> <li>anti-fatigue matting should be large enough to accommodate movement of the person</li> </ul>	✓		low to med	med	med
		96. Provide appropriate shoe inserts					
		9. Eliminate exposure to hard edges		✓	med	low	low
		<ul style="list-style-type: none"> <li>provide high density foam padding</li> </ul>					
		13. Encourage ergonomic work techniques	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage individual to allow the item to move closer using the conveyor</li> </ul>					
		150. Re-design the work space		✓	med	low	med
		<ul style="list-style-type: none"> <li>use a divertor to move products closer to the cashier</li> </ul>					



### Legs/Feet (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Lack of toe clearance</li> </ul>	80. Provide adequate leg clearance		✓	med to high	low	med
		81. Provide adequate toe clearance		✓	med to high	low	med
		132. Remove obstructions <ul style="list-style-type: none"> <li>clear boxes, items from floor to allow room</li> </ul>	✓				

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Glare on monitor/screen</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>position key pad read out to minimize glare</li> </ul>	✓		low to med	high	med
		102. Provide displays which are readable and easy to understand		✓	med to high	med	med
		109. Provide protection from glare from overhead lights/tasks lights	✓		low	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	20. Incorporate rest pauses	✓		low	high	med


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## CASE STUDY - Transporting Loads on Non-Powered Carts


### TASK TITLE: Transporting Loads on Non-Powered Carts

<b>Task Description:</b>	<p>The Transporting Loads on Non-Powered Carts task involves the use of non-powered carts to move loads (palletized or loose) from one location to another. While the most common cart in a warehouse setting is the pallet jack, other devices considered include: hand truck, shelf style truck (e.g., bottom, center, and top shelves with a handle at one end), and flatbed style (e.g., single surface low to the ground with a handle at one end). Carts may be equipped with swivel wheels that may or may not lock into position. Carts may be used in open areas or to navigate narrow aisles. The carts are typically pushed as well as pulled. [Since the work situation can also include loading and unloading carts, please refer to Case Study 11 – Loading/Unloading for further guidance.]</p> <p>Typical environments in which transporting loads on non-powered carts occurs (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• pallet transport/transfer</li> <li>• short distance stock delivery (e.g., from storage to point of use)</li> </ul>
<b>Job Performance Measures Most Often Impacted by Transporting Loads on Non-Powered Carts</b>	<p>Measure of work performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> <li>• the number of loads handled per day.</li> </ul> <p>(Note: It is also important that the carts are handled in such a way as to avoid damage to the materials being transported or accidents involving other personnel and the surrounding area and equipment.)</p>
<b>Typical Employee Comments about Transporting loads on Non-Powered Carts</b>	<p>Employees typically experience discomfort in the back/torso, shoulders and sometimes legs/feet.</p> <p>The back/torso is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating, or lower.</p>
<b>Suggested Level II Analysis:</b>	<p>Dynamic task Analysis, Biomechanical Lifting Analysis, NIOSH Lifting Equation, Push/Pull Analysis</p>

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Handles are too high</li> <li>Handle is too close to the cart; inadequate clearance for the legs when walking</li> </ul> 	94. Provide appropriate handles <ul style="list-style-type: none"> <li>modify current handles or add a handle; handle height should be between 36-44”(91-112cm) above the floor, fixed handles should be extended at least 8”(20cm) from the cart.</li> </ul>	✓		low	low	low
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Repeated pumping of pallet jack to raise pallet off the floor for transport</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide a powered scissors jack</li> <li>use a fork lift to transport load</li> </ul>	✓	✓	high low	low low	med med

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Manual pushing/pulling loads</li> </ul> 	67. Provide a powered cart <ul style="list-style-type: none"> <li>contact vendor to consider providing powered vehicles</li> </ul>		✓	med to high	low	med
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Emergency stopping of carts can create excessive force on the shoulders</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>contact supplier to investigate equipping pallet jack or other carts with a hand brake</li> </ul>		✓	med	low	low
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Viewing around loads</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>investigate the use of convex mirrors mounted on ceiling to see work area (particularly at intersections)</li> </ul>	✓		low to med	low	med
		147. Provide an alternative container <ul style="list-style-type: none"> <li>reduce high/size of load</li> </ul>		✓	low to med	low	med

## Hands/Wrists/Arms


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Repeated pumping of pallet jack to raise pallet off the floor for transport</li> <li>Handle on cart too low</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide a powered scissors jack</li> <li>use a fork lift to transport load</li> </ul>	✓	✓	high low	low low	med med
		94. Provide appropriate handles <ul style="list-style-type: none"> <li>replace horizontal handle with two vertical handles, shoulder width apart</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>reposition horizontal handle at between 36-44 inches (91-112cm) above the floor</li> </ul>	✓		low	low	low
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Hands/Wrists/Arms (cont'd)


Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Repeated pumping of pallet jack to raise pallet off the floor for transport</li> <li>Pushing/pulling loads</li> <li>Inappropriate wheel material (e.g., steel/too hard for floor type) or poor wheel maintenance (e.g., stuck or shaking wheels)</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>provide a portable pneumatic scissors jack</li> <li>use a fork lift to transport load</li> </ul>	✓	✓	high	low	med
		67. Provide a powered cart <ul style="list-style-type: none"> <li>use a powered cart if forces exceed guidance</li> </ul>		✓	low	low	med
		19. Improve wheel condition <ul style="list-style-type: none"> <li>replace worn wheels when necessary; carts with damaged wheels can jam suddenly</li> </ul>		✓	med to high	low	med
		119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels which roll easily on floor surface</li> </ul>		✓	med	low	med
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Repeated pushing of carts over rough or damaged floor surfaces</li> <li>Inappropriate wheel material (e.g., steel/too hard for floor type) or poor wheel maintenance (e.g., stuck or shaking wheels)</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> </ul>	✓	✓	low med	low low	low med
		119. Provide wheels <ul style="list-style-type: none"> <li>replace worn wheels when necessary; carts with flattened wheels are harder to push than those whose wheels are rounded</li> </ul>		✓	med	low	med
		<ul style="list-style-type: none"> <li>replace steel wheels with softer material (when appropriate for the work environment)</li> </ul>		✓	med	low	med



### Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes	Cost	Impact On
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Handle shape creates a pressure point in the hand</li> </ul> 	9. Eliminate exposure to hard edges <ul style="list-style-type: none"> <li>wrap square tubular handles with padding to cushion the hand</li> <li>replace blunt edge handles with a rounded design</li> </ul>	✓ ✓	low low	low low low
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> </ul>	23. Increase room temperature <ul style="list-style-type: none"> <li>encourage employees to keep doors shut</li> </ul> 93. Provide appropriate gloves           12. Encourage appropriate seasonal clothing	✓ ✓ ✓	low low low	low low low

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Placing loose stock or other items on lower shelves on cart or on flat bed cart</li> </ul>	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>avoid use of the bottom shelf on carts whenever possible; load carts to maintain load stability</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Handle on cart is too low</li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>replace horizontal handle with two vertical handles, shoulder width apart</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>reposition horizontal handle at between 36-44"(91-112cm) above the floor</li> </ul>	✓		low	low	low

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Carts drift or are difficult to control, especially when turning corners</li> </ul>	119. Provide wheels <ul style="list-style-type: none"> <li>place swivel wheels on only the “handle side” of the cart for optimum control (push carts)</li> <li>if all wheels swivel, “lock” the wheel position into “straight” on the side opposite the handle</li> </ul>		✓	med	low	low
			✓		low	low	low
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>do not overload trucks; the height of the load should be no higher than 55”(140cm) if the load is to be pushed</li> </ul>	✓		low	low	low
	Maneuvering through narrow aisles or around obstructions	82. Provide adequate work space <ul style="list-style-type: none"> <li>increase the width of the aisles to at least 11 feet (assuming a one-way flow) and maintain appropriate width by painting guidelines or pallet position spaces on the floor</li> </ul>		✓	high	low	low
	<ul style="list-style-type: none"> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and materials handling techniques</li> </ul>	✓		low	low	low
		<ul style="list-style-type: none"> <li>encourage person to use legs and pivot while transferring loads or loading/unloading carts</li> </ul>	✓		low	low	low

### **Back/Torso (cont'd)**

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
14. High speed, sudden movements or Lifting awkward, uneven, shifting or bulky items.	<ul style="list-style-type: none"> <li>Emergency stopping of carts can create excessive force on the shoulders</li> </ul>	148. Provide appropriate equipment <ul style="list-style-type: none"> <li>contact supplier to investigate equipping pallet jack or other carts with a hand brake</li> </ul>		✓	med	low	low
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Handle on cart is too low</li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>replace horizontal handle with two vertical handles, shoulder width apart</li> <li>reposition horizontal handle at between 36-44"(91-112cm) above the floor</li> </ul>	✓		low	low	low
			✓		low	low	low
16. Lifting forces	<ul style="list-style-type: none"> <li>Item(s) being lifted onto/off cart is too heavy</li> </ul>	61. Provide a mechanical lift device <ul style="list-style-type: none"> <li>use a hoist to perform the lift</li> <li>use a portable pneumatic scissors jack; position the height of the jack so the operator can slide rather than lift the item</li> </ul>		✓ ✓	high high	low low	med med

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling or sliding resistance of cart causes high forces</li> </ul>	119. Provide wheels <ul style="list-style-type: none"> <li>provide wheels with appropriate bearings and tread composition</li> </ul>		✓	med	low	med
	<ul style="list-style-type: none"> <li>Worn wheels increase forces</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>replace worn wheels</li> </ul>		✓	med	low	med
	<ul style="list-style-type: none"> <li>Cart/load is too heavy to be moved manually (maximum forces: start - 50 pounds force, maintain travel - 25 pounds force, emergency stop (within 3 feet) - 80 pounds force)</li> </ul>	151. Reduce weight of load on cart  67. Provide a powered cart <ul style="list-style-type: none"> <li>provide a motorized cart</li> </ul>	✓		low	low	low
	<ul style="list-style-type: none"> <li>Poor floor surface/condition</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> </ul>	✓ ✓		high	low	med
					low med	low low	low med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
20. Standing on hard surfaces or exposure to hard edges on legs, knees, and feet	<ul style="list-style-type: none"> <li>Continuous walking while transporting loads can increase the potential for fatigue in the legs and feet</li> </ul>	20. Incorporate rest pauses  96. Provide appropriate shoe inserts	✓	✓	low  low	low  low	low  low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
22. Awkward foot postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Increase visual access to work <ul style="list-style-type: none"> <li>Light level should be 10fc to 20fc for the work</li> </ul>		✓	low to high	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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## CASE STUDY - Lifting

### TASK TITLE: Lifting

<b>Task Description:</b>	<p>Lifting involves the manual handling of items of varying weights and sizes. It involves the transfer of items at between varying heights and locations (floor/shelves or a work surface). Pushing and pulling typically occur while moving carts or pieces of equipment. Pushing and pulling can also occur while removing and installing components.</p> <ul style="list-style-type: none"><li>• Lifting/pushing/pulling are components of many jobs.</li></ul>
<b>Job Performance Measures Most Often Impacted by Lifting:</b>	<p>Measures of performance can include (but are not necessarily limited to):</p> <ul style="list-style-type: none"><li>• Speed of completion of the larger task.</li><li>• Component damage during handling.</li></ul>
<b>Typical Employee Comments about Lifting:</b>	<p>Employees typically complain about discomfort in the back/torso, legs/feet, hands/wrists, arms, and shoulders/neck.</p> <p>The back/torso is the body area that most commonly receives a “High” priority rating. The remaining body areas, with the exception of the head/eyes, are more likely to receive a “Medium” priority rating or lower.</p>
<b>Suggested Level II Analysis:</b>	NIOSH Lifting Equation, Biomechanical Lifting Analysis, Push/Pull Force Analysis

## Shoulder/Neck

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
1. Reaching	<ul style="list-style-type: none"> <li>Object is too high</li> <li>Object is too far away</li> </ul>	32. Lower the work piece/work surface	✓		low	med	med
		<ul style="list-style-type: none"> <li>place heaviest items between shoulder height and knuckle height (25"-50") (64-127 cm)</li> <li>place heaviest items on middle shelves of storage racks</li> </ul>	✓		low	med	med
		38. Move closer to the work location	✓	✓	med	med	med
		41. Move work piece closer to body <ul style="list-style-type: none"> <li>slide load to edge before lifting</li> </ul>	✓		low	med	med
2. Arm forces: Repeated arm forces or holding/ carrying materials	<ul style="list-style-type: none"> <li>Item is too heavy</li> </ul>	61. Provide a mechanical lift device		✓	high	low	med
		131. Reduce weight of work piece		✓	med	med	med
		142. Use two or more persons to perform the transfer	✓		low	low	low
		26. Increase weight of work piece <ul style="list-style-type: none"> <li>ensures that the item will be handled mechanically</li> </ul>		✓	med	med	med
		4. Change a lifting/carrying task into a rolling or sliding task <ul style="list-style-type: none"> <li>use a portable lift cart to retrieve and deliver objects</li> </ul>		✓	low to med	med	med

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>High forces required to install or remove component</li> </ul>	128. Reduce force required to install or remove the component <ul style="list-style-type: none"> <li>use lubricant where feasible</li> <li>modify design of component or subsystem to reduce forces during installation or removal</li> </ul>	✓	✓	low high	med med	med med
	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> <li>install appropriate wheels</li> </ul>	✓	✓	med low to med	med med	med med
	<ul style="list-style-type: none"> <li>Cart or piece of equipment is too heavy to be pushed manually</li> </ul>	131. Reduce weight of work piece <ul style="list-style-type: none"> <li>reduce number of items or weight of items on cart</li> </ul>	✓		low	low	med
		67. Provide a powered cart		✓	med to high	low	med
	<ul style="list-style-type: none"> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low med med to high	low low low	med med med
	<ul style="list-style-type: none"> <li>Item is stuck or wedged in place</li> </ul>	132. Remove obstacles <ul style="list-style-type: none"> <li>take time to remove obstacles interfering with movement rather than trying to “force” the object free</li> </ul>	✓		low	low	low

### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Carry distance is more than three steps</li> </ul>	126. Reduce carry distance <ul style="list-style-type: none"> <li>arrange storage and work areas to reduce travel distances</li> </ul>	✓		low	low	med
		48. Provide a cart <ul style="list-style-type: none"> <li>to transport materials</li> </ul>		✓	med	low	med
		11. Eliminate unnecessary tasks <ul style="list-style-type: none"> <li>eliminate or combine handling tasks</li> </ul>	✓		low	low	med
		<ul style="list-style-type: none"> <li>transport items in larger quantities instead of handling them individually</li> </ul>	✓		low	low	med
		37. Modify facilities to decrease handling <ul style="list-style-type: none"> <li>widen doors to allow materials to be handled on carts</li> </ul>		✓	high	low	med


### Shoulder/Neck (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
3. High speed, sudden shoulder movements	<ul style="list-style-type: none"> <li>Speed of lift</li> <li>Item is stuck in location</li> <li>Item is difficult to install</li> </ul>	13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to avoid rushing while handling items</li> </ul>	✓		low	low	med
		128. Reduce force required to install or remove the component <ul style="list-style-type: none"> <li>use lubricant where feasible</li> <li>modify design of component or subsystem to reduce forces during installation or removal</li> </ul>	✓	✓	low high	med med	med med
4. Head/neck bent or twisted	<ul style="list-style-type: none"> <li>Inadequate head room causes awkward postures</li> </ul>	82. Provide adequate workspace <ul style="list-style-type: none"> <li>store item in area where there is adequate headroom</li> <li>use flow-racks to cue items to the front of a storage rack</li> </ul>	✓	✓	low high	low low	med high
		55. Provide a hook-type tool to pull items		✓	low	low	med


## Hands/Wrists/Arms

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
5. Bent wrists/repeated wrist movements or repeated forearm rotation	<ul style="list-style-type: none"> <li>Shape of grasping location (handle) on work piece causes awkward wrist positions</li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide handles which pivot slightly to permit a straight wrist during handling</li> <li>provide cut-outs on boxes or containers</li> </ul>		✓	med	low	med
				✓	med	low	med
6. Repeated manipulations with fingers	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
7. Hyper-extension of finger/thumb or repeated single finger activation	<ul style="list-style-type: none"> <li>Handling large products</li> </ul>	148. Provide an alternate container	✓	✓	med	med	med
		<ul style="list-style-type: none"> <li>provide a smaller container</li> <li>provide a more stable container</li> </ul>		✓	med	med	med
		94. Provide appropriate handles		✓	med	med	med
		61. Provide a mechanical lift device		✓	med	med	med

## Hands/Wrists/Arms (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
8. Hand/grip forces	<ul style="list-style-type: none"> <li>Item is difficult to grasp</li> <li>Item has no handles</li> <li>Item is slippery (see Figure 1.1)</li> </ul> 	61. Provide a mechanical lift device		✓	med to high	low	med
		94. Provide appropriate handles		✓	med	med	med
		93. Provide appropriate gloves <ul style="list-style-type: none"> <li>use gloves with a high friction surface</li> </ul>	✓		low	low	low
9. High speed hand/wrist/arm movements or vibration, impact or torque to the hand	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
10. Exposure to hard edges	<ul style="list-style-type: none"> <li>Handles have hard edges</li> </ul>	94. Provide appropriate handles <ul style="list-style-type: none"> <li>provide compressible handles</li> </ul>		✓	low to med	low	low
		61. Provide a mechanical lift device		✓	med	med	med
	<ul style="list-style-type: none"> <li>Item has small handles</li> </ul>	88. Provide an appropriate handle diameter	✓		low to med	low	low

## Back/Torso

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
11. Hands and fingers exposed to cold temperatures	<ul style="list-style-type: none"> <li>Work area is too cold</li> </ul>	105. Provide portable heaters		✓	med	med	med
		93. Provide appropriate gloves		✓	low	med	med
12. Repeated forward or sideways bending movements	<ul style="list-style-type: none"> <li>Object is too low (see Figure 1.2)</li> </ul> 	124. Raise the work piece/work surface <ul style="list-style-type: none"> <li>place heaviest items between knuckle and shoulder height (25"-50") (64-127 cm)</li> <li>provide a fixed table to support work piece</li> <li>provide an adjustable table for work piece</li> <li>place heaviest items on middle shelves of storage racks</li> </ul>	✓		low	low	low
				✓	low	med	med
				✓	high	med	high
			✓		low	low	med
		38. Move closer to the work location	✓	✓	med	med	med
		132. Remove obstructions	✓		low	med	med
		41. Move work piece closer to the body	✓		low	med	med
	<ul style="list-style-type: none"> <li>Object is too far away</li> </ul>	46. Provide a ball-bearing rotation table		✓	med to high	low	med



## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Lifting item out of a deep container causes awkward bending</li> </ul>	69. Provide a smaller container	✓	✓	med	low	med
	<ul style="list-style-type: none"> <li>Item is handled in a restricted space</li> <li>Work area layout</li> </ul>	82. Provide adequate work space		✓	low to med	low	med
		130.Reduce the angle a person turns to transfer an item	✓		low	low	med
		<ul style="list-style-type: none"> <li>for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> </ul>					
	<ul style="list-style-type: none"> <li>Person tends to use the back to lift instead of using the legs to assist in the lift (check to make sure that there is no contributing factor in the workplace)</li> </ul>	13. Encourage ergonomic work techniques	✓		low	low	med
		<ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> <li>encourage person to use leg muscles to lift</li> </ul>	✓		low	low	med
13. Twisting of the lower back	<ul style="list-style-type: none"> <li>Access is restricted to a component that needs to be removed</li> </ul>	82. Provide adequate workspace	✓		low	low	high
		<ul style="list-style-type: none"> <li>improve access during installation and removal</li> </ul>					

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Item is handled in a restricted space</li> <li>Work area layout</li> <li>Person tends to twist with the back instead of using the legs and feet to pivot</li> </ul>	61. Provide mechanical lift device <ul style="list-style-type: none"> <li>provide mechanical assistance for handling the load</li> </ul>		✓	med to high	low	med
		130.Reduce the angle a person turns to transfer an item <ul style="list-style-type: none"> <li>for example, if the transfer involves a 180 degree twist, move the source or destination to reduce the twist to 90 degrees or less</li> </ul>	✓		low	low	med
		13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>provide training on ergonomics principles and lifting techniques</li> </ul>	✓		low	low	med
		<ul style="list-style-type: none"> <li>encourage person to use legs pivot when handling a load</li> </ul>	✓		low	low	med
14. High speed, sudden movements	<ul style="list-style-type: none"> <li>Item is stuck in location</li> <li>Item is difficult to install or remove</li> </ul>	128. Reduce force required to install or remove the component <ul style="list-style-type: none"> <li>use lubricant where feasible</li> <li>modify design of component or subsystem to reduce forces during installation or removal</li> </ul>	✓	✓	low high	low med	med high

### Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
	<ul style="list-style-type: none"> <li>Item is bulky, awkward or shifts easily</li> <li>Person tends to lift with a jerky motion instead of a smooth motion</li> </ul>	61. Provide a mechanical lift device  13. Encourage ergonomic work techniques <ul style="list-style-type: none"> <li>encourage person to avoid rushing while handling items</li> </ul>	✓	✓	med  low	med  low	med  med
15. Static, awkward back postures	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					
16. Lifting forces	<ul style="list-style-type: none"> <li>Item is too heavy</li> <li>High forces are required to install or remove the component</li> </ul>	61. Provide a mechanical lift device  131. Reduce weight of work piece  142. Use two or more persons to perform the transfer  26. Increase weight of work piece <ul style="list-style-type: none"> <li>ensures that the item will be handled mechanically</li> </ul> 128. Reduce force required to install or remove the component <ul style="list-style-type: none"> <li>use lubricant where feasible</li> <li>modify design of component or subsystem to reduce forces during installation or removal</li> </ul>	 ✓  ✓	✓   ✓  ✓	high low low  high  low high	low low low  low  low low	med med med  med  med med

## Back/Torso (cont'd)

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
17. Pushing or pulling	<ul style="list-style-type: none"> <li>Rolling/sliding resistance of cart or piece of equipment causes high forces</li> <li>Cart or piece of equipment is too heavy to be pushed manually</li> <li>Floor/surface condition causes high forces during a rolling or sliding task</li> </ul>	19. Improve wheel condition <ul style="list-style-type: none"> <li>repair wheels on carts or equipment</li> </ul>	✓		low	low	med
		131. Reduce weight of work piece <ul style="list-style-type: none"> <li>reduce number of items or weight of items on cart</li> </ul>	✓		low	low	med
		67. Provide a powered cart <ul style="list-style-type: none"> <li>provide motorized assistance to transport cart or piece of equipment</li> </ul>		✓	high	low	high
		17. Improve floor condition <ul style="list-style-type: none"> <li>improve housekeeping</li> <li>repair cracks or gaps in floor</li> <li>provide ramps to compensate for minor differences in floor height</li> </ul>	✓ ✓	✓	low med high	low low low	med med med
18. Whole body vibration	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Legs/Feet

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
19. Fixed position, standing	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>						
20. Exposure to hard edges on legs, knees, and feet <u>or</u> Standing on hard surfaces	<ul style="list-style-type: none"> <li>Standing on hard surfaces</li> </ul>	86. Provide an appropriate anti-fatigue mat	✓		low to med	low	low
		96. Provide appropriate shoe inserts	✓		low	low	low
21. Awkward leg postures	<ul style="list-style-type: none"> <li>Work object is too low</li> </ul>	124. Raise the work piece/ work surface	✓		med	med	med
		118. Provide support for the work piece <ul style="list-style-type: none"> <li>provide an adjustable table for work piece</li> </ul>		✓	high	med	high
22. Standing foot pedal	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

## Head/Eyes

Job Factor	Potential Causes	Corrective Action	Level of Changes		Cost	Impact On	
			✓ Minor Modification	✓ Major Change		Quality	Productivity
23. Difficult to see/light levels too low/too high	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	18. Improve visual access to work <ul style="list-style-type: none"> <li>light levels should be 50 fc - 70 fc for work</li> </ul>		✓	low to high	med	med
24. Intensive visual tasks, staring at work objects for long periods	<ul style="list-style-type: none"> <li>Rarely occurs</li> </ul>	N/A					

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